THE UNIVERSITY OF HULL

Resource-based Logistics (RBL) and Logistics Performance

being a Thesis submitted for the Degree of Doctor of Philosophy

in the University of Hull

by

Noorliza Karia

Bachelor of Science in Business Administration
(Production and Operations Management), University of Denver, 1988
Master of Business Administration, University Science Malaysia, 1999

March 2011

DEDICATION

‘Praise be to Allah who created the heavens and the earth, and made the darkness and light’ (al-An’am 1)

All praises to Allah. I am thankful Allah for giving me peace, good life and success through my parent and family great prayers. I pray all continue being blessed by Him and greatly appreciate their undivided supports, patience and sacrifices while I am pursuing my professional aim**.** In the name of Allah s.w.t., I am dedicating this thesis

To my late parents

Almarhumah Hajah Rokiah Haji Ahmad

And

Almarhum Haji Karia Din

MAY ALLAH HAVE MERCY ON THEIR SOULS AND GRANT THEM JANNAH

To my beloved husband

Haji Muhammad Hasmi Haji Abu Hassan Asaari

And my brilliant children

Nur Yusrina

Muhammad Hazzeem Asyraff

Muhammad Haqqeen Affhamm

Nur Firzana

MAY ALLAH BLESS YOU AND GRANT YOU SUCCESS AND JANNAH

AMEEN

ACKNOWLEDGEMENT

In the name of Allah S.W.T., the most Beneficent, the most Merciful thus this thesis has been possible.

My deepest gratitude goes to the Ministry of Higher Education Malaysia and Universiti Sains Malaysia for awarding me a full scholarship to complete this research. A special thanks goes to the former Dean, School of Management, Y. Bhg. Professor Dato' Dr. Daing Nasir Ibrahim, for encouraging and providing avenues for my career.

I am most privileged to have these two distinguished professors as my supervisors. I would like to acknowledge my gratitude to Professor Chee Yew Wong and Professor Chandra Lalwani, for their constructive academic supervision and motivation style to encourage my spirit during my study. This thesis would not have been accomplished without their guidance, patience and support. They guided me to do research and taught me to think critically. Their knowledge, valuable ideas and constructive comments have enhanced this thesis. Both of them have enhanced my research skills and provided me with priceless knowledge. If not for all these, I would not have been able to produce five publications and complete my study within this time frame while at the same time acquiring this amount of knowledge. From them, I have learned the rigours of research and the idiosyncrasies of writing papers for conferences and journals.

Prof. Chandra, complemented by the efforts of Prof. Chee Wong, wonderfully, always showed concern for my progress, reviewed my works and was always ready to provide support whenever I needed it. Prof. Chee is simply amazing and inspires excellence. I am eternally grateful for his detailed comments and suggestions, for helping me put my thoughts and ideas into proper perspectives, for always reviewing and returning my drafts promptly in spite of his already tight schedule, for putting me back on track each time I stumbled and faltered in my steps and for his continuous encouragement.

I am indebted to my late parents and parent in-law for their prayers, undivided supports, patience and understanding in my absence during the long period of accomplishing this thesis. My deepest appreciation goes to my beloved husband, Muhammad Hasmi, who tremendously supports and comforts during this demanding and challenging period. I am also grateful to my four angles, for always giving strength to carry on and making warmth of my life with their love, patience and understanding; and for always waiting for my thesis accomplishment. Last but not least, I am thankful to my two sisters, Norizan and Norul Zakiah, and their families for their countless support.

My sincere appreciation is also extended to my respondents, Malaysian LSPs, Malaysian CILT and in particular those who helped me with the data collection. It is so endearing to have them show interest in my research. My gratitude also goes to the staff of the School of Business and Graduate School of the University of Hull. Last, but not the least, warmest appreciation to all PhD mates and friends for helping me directly or indirectly and the chats and jokes that helped to release my stress.

For every one of you, I can only pray that God will bestow upon you a blessed life.

LIST OF PUBLICATIONS

Wong, C. Y., & Karia, N. (2010). Explaining the competitve advantage of logistics providers: A resource-based view approach. *International Journal of Production Economics , 128,* 51-67.

Karia, N., Wong, C.Y., Lalwani, C. (2010). *The impact of resource-based logistics on logistics performance: an empirical study of LSPs*. Logistics Research Network (LRN) 2010 Conference, Harrogate, September 2010.

Karia, N., Wong, C. Y., Lalwani, C. (2010). *The impact of logistics resources on performance: a survey of Malaysian logistics service providers.* International Symposium on Logistics (ISL), Kuala Lumpur, July 2010.

Karia, N., Wong, C. Y., Lalwani, C. (2011). *Analysis of the bundling effects of resources-based logistics: a survey of Malaysian logistics service providers*. Logistics Research Network (2011) Conference, Plymouth, September 2011.

Karia, N. and Wong, C. Y. (2011). The impact of logistics resources on the performance of Malaysian logistics service providers. *Production Planning and Control Journal, ISL 2010 special issue (Forthcoming).*

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

The increasing trends of logistics outsourcing have forced logistics service providers (LSPs) to more effectively leverage their productive resources to provide superior service performance. The current logistics literature has identified some strategic logistics resources and their performance impacts but there is a lack of knowledge on the combined effects of such resources. The main objective of this research is to identify logistics resources - called resource-based logistics (RBL) – acquired by LSPs and to examine the impacts of RBL on logistics performance. Based on the resource-based view (RBV) theory, this research develops constructs and measurements for logistics resources (RBL) and logistics performance (LP) and further examines the impacts of RBL on logistics performance in terms of customer service innovation (customer service and service innovation) and cost leadership. Based on data from interviews and a survey of 123 Malaysian LSPs, factor analyses were used to establish five groups of logistics resources - technology, physical, management, relational and organizational resources, contributing to the development of constructs and measurements for logistics resources from the LSP perspective. While simple regression analyses suggest that each RBL was positively associated with customer service innovation and cost leadership, further stepwise regression analyses suggest customer service innovation was enhanced when organizational and technology resources were bundled together. These two resources largely mediated the relationships between physical, relational and management expertise and customer service innovation. Similarly, the analyses suggest that cost leadership was enhanced when organizational and management expertise resources were bundled together; these two resources mediated the relationships between technological, physical, and relational resources and cost leadership. The implications of the results for theory and practice are significant. This research provides empirical evidence for the development of a theoretical model for logistics resources grounded in RBV theory. The detailed bundling and mediating effects of logistics resources represent novel empirical evidence needed to enhance the understanding of LSP performance. This research recommends that LSPs should embark on developing capabilities in the five RBL. Especially, logistics managers should focus on developing and bundling their organizational, management and technology resources more effectively. In addition this research proposes a theoretical model for future research into the competitive advantage of LSPs.

CHAPTER 1: INTRODUCTION

1.1 Research Background

A logistics service provider (LSP) is a provider of an industrial logistics service that specializes in providing various types of logistics such as transportation, warehousing and freight forwarding. On behalf of clients LSPs perform logistics functions such as order processing, inventory, transportation carriers and the combination of warehousing, materials handling and packaging using a network of facilities. Such services are very important to support the procurement, manufacturing and customer accommodation operational requirements of a manufacturer or retailer (Bowersox, 2007; Grant et al., 2006).

The globalization, growth of imports and export, service oriented economies and logistics outsourcing have brought new challenges to LSPs. Their role is sizeable and expanding rapidly (Ellinger et al., 2008), as clients asking to manage everything from the front-end to the customer's location where delivery is made. Indeed they expect LSPs to deliver new services when they need them which sometimes extend beyond the LSP's capabilities; for example, the need for a wider portfolio of logistics services, geographical coverage and advanced information technology (Langley and Capgemini, 2007). Consequently, LSPs find themselves facing the situation that each of their clients has a unique set of requirements, a different set of demands. The growing demands on logistics service providers has presented them with strategic challenges for exploiting and making logistics resources more productive as a competitive resource in a complex and unpredictable environment. According to Ballou (2004) the growth of the service sector, environmental issues and information technology will continue to support the vital nature of logistics for many years to come.

Given the growing demands on LSPs, they are expected to be excellent in providing integrated services in the marketplace within a new competitive landscape characterized by increasing globalization; and rapid expanding technology and knowledge. Yet, some LSPs are still operating with inappropriate resources such as low-end technology at high cost. Also, LSPs are facing problems with hiring skilled and knowledgeable workers with formal logistics education and training. Consequently, according to Gunasekaran and Ngai (2003), LSPs are facing many problems, including delay, inability to provide inter-linkage services, high operating costs, high rate of inaccuracy and lack of flexibility in responding to changing and demanding requirements. With these setbacks, LSPs are unable to meet the ever increasing scope of clients' requirements.

Some recent logistics literature suggests that it is essential for LSPs to gain access to and transform the right resources into greater logistics performance (Lai et al., 2008; Yang et al., 2009; Wong and Karia, 2010). Such logistics resources, called resource-based logistics (RBL) in this research (will be defined in page 7 and chapter 3), are vital in managing the movement of products from point of origin to point of consumption. The literature argues that the "acquisition" and "use" of appropriate or "strategic" RBL promotes an excellent quality and productivity of movement of physical goods and services to meet dynamic and high customer expectations. Without understanding the sources of logistics performance for LSPs (i.e. what logistics resources are acquired by LSP and how they impacts LSP performance), problems such as delay, incomplete service and high product damage will arise and cause cost inefficiency and customer dissatisfaction. Products would not be delivered to customers/end users accurately at lower cost without an effective and efficient utilization of RBL.

In the attempt to understand "strategic" resources for successful LSPs and what constitute the total logistics resources or RBL acquired by LSPs, no agreement has yet been reached from the existing logistics literature. Intuitively, it should not just include the basic inputs for operations such as land, capital and labour as prescribed in neoclassical theory. The world of supply chain and logistics is changing rapidly and therefore continuous changes in logistics resources acquired by LSPs may provide temporary competitive advantage. They are looking for ways to improve their logistics performance by having better technologies, superior inputs, better trained employees and effective management to meet such customer expectations. It is thought that the use of technology that is affordable and flexible will expand and contract with new businesses. For instance, IT is valuable in helping LSPs to monitor the status of their inventories, improve the utilization of their transportation and warehouse assets, eliminate duplication of effort in performing different logistics activities, enable LSPs to meet demand in a timely manner and provide logistics services effectively (Lai et al., 2005). Beyond such basic, human and technology resources, one has to consider the capability to create resource and bundle resources to enhance performance and competitive advantage.

1.2 Research Gap

While there are already some efforts to identify an LSP's "strategic" logistics resources or RBL and to understand how it may have an impact on an LSP's performance, the logistics literature suffers from at least four deficiencies or gaps. The first gap is that the logistics literature has mainly studied logistics resources and capabilities from the manufacturer or retailer perspective but very few studies have examined logistics performance from the service provider perspective. The second gap is that studies of the impact of logistics resources or capabilities on logistics performance have limited theoretical foundation. The third gap is that the logistics literature has not considered the total constitution of an LSP's logistics resources and, more importantly, the effects of resource bundling. The final gap is that previous logistics literature has examined the impact of logistics resources on different aspects of LSP performance, leaving the comparison of results or meta-analysis meaningless. These four gaps are further elaborated as follows.

Logistics studies have, typically, been conducted within the domain of the logistics user perspective (Gunasekaran, 2003) such as manufacturing companies or retailers in the supply chain. Interest in logistics resources has already begun with Chiu (1995) followed by Sink et al. (1996), Myers et al. (1996), Larson and Kulchitsky (1999), Alshawi (2001), Stank (2003) and Knemeyer and Murphy (2004) but they have ignored the service provider perspective (Wong and Karia, 2010). To date studies from the LSP perspective, undertaken by Panayides and So (2005a & b), Panayides (2007a & b), Brah and Lim (2006), Ellinger et al. (2008) and Wong and Karia (2010) were the most relevant to this research and provide empirical evidence to support the theoretical underpinning that resources will have a beneficial impact on the performance of LSPs.

This research argues that it is important to identify, conceptualize and measure RBL accessed by LSPs and empirically examine them on LSP performance. RBL refers to tangible and intangible resources and capabilities which are acquired, provided and developed by an LSP. RBL is viewed as bundles of resources and capabilities which allow LSPs to perform logistics operations. LSPs create bundles of resources and capabilities which are the determinants of logistics performance and a means for sustainable competitive advantage. Yet, the determinants of logistics performance have not been followed up with sufficient empirical investigation where not many authors have examined RBL and logistics performance. In an attempt to address these gaps in literature, the purpose of this research is to empirically assess LSPs in terms of RBL and examine the potential bundling of RBL on logistics performance.

However, logistics literature has not considered all possible resources or a resource bundles into a single theoretical framework, where such resources enable cost reduction for transportation and storage, and increase customer satisfaction. Some studies focus only on tangible resources or intangible resources while others focus on IT alone without taking into account all necessary resources (Lin, 2007; 2008; Lai et al., 2008). Thus, it is argued that an enhanced understanding of the relevant RBL and its constructs will help to contribute to the explanation of LSP logistics performance.

The other gap in logistics literature lies with the issue of the dependent variable little is known about what enables LSPs to performance better than others. Previous studies have examined different aspects of LSP performance such as service capability (Lai, 2004; Yang et al., 2009), innovation capability (Yang et al., 2009), market orientation (Panayides, 2004) and technology and quality practice (Brah and Lim, 2006). It is clear that some of these are not performance variable but capability variables instead. Other dependent variables such as service performance (Lai, 2004), financial performance (Panayides, 2004), cost, customer service (delivery, quality and flexibility), process quality (Brah and Lim 2006) and customer service and financial performance (Yang et al., 2009) have been applied. However, there is no agreement on which key performance indicators (KPIs) be used for the logistics performance measurement (Wilding and Juriado, 2004). It is argued that the approach for measuring logistics performance should be a multidimensional construct that reflects in a composite measure of performance. Hence, there is a need to apply a composite measure of the logistics performance for LSPs which represents the competitive advantage of LSPs.

1.3 Research Objectives

Based upon the above research gap, this research attempts to achieve four research objectives: the general objective of this research is to examine resource-based logistics (RBL) within the LSP context and its impact on logistics performance. More specifically, this research investigates the following research objectives:

1. To develop the RBL constructs and identify the components of RBL
2. To develop the logistics performance (LP) constructs for LSPs
3. To understand and analyse the relationships between RBL and LP
4. To develop a RBL framework for practitioners to improve logistics performance.

The first research objective aims at identifying, conceptualizing and measuring the key logistics resources acquired by LSPs to run their logistics business. Based on the resource-based view (RBV) of the firm, it is suggested that differences in LSP performance can be explained by bundles of RBL. Therefore LSP performance is dependent on how firms bundle their RBL in ways which are different from competitors. A different outcome is assumed when RBL is bundled differently. This implies that RBL have impact on logistics performance and might influence the effectiveness of LSPs. So it is essential for LSPs to gain access to and transform RBL into superior performance.

The second research objective is to develop construct for logistics performance relevant to an LSP's competitive advantage. The aim is to examine key logistics performance measures which are widely considered in logistics literature specifically for LSPs. This objective would contribute to a new scale questionnaire items for logistics performance especially from the LSP perspective.

The third objective is to understand the relationships between RBL and logistics performance, that is, which resources contribute most to logistics performance and how such resources affect logistics performance. By acquiring and bundling higher RBL, higher levels of logistics performance can be reached due to better equipment and resource utilization, advanced technology, better collaboration and communication among logistics networks and excellent staff. It is thought that the RBL made up of tangible and intangible resources such as physical resources, technology resources, relational resources, organizational resources and management expertise resources identified by objective 1 would enhance logistics performance such as customer service, service innovation and cost leadership. This would contribute to the development of theoretical foundations, theory and empirical evidence for logistics and strategy literature.

The fourth objective is to propose a RBL model for practitioners, particularly, but not exclusively, for LSPs to improve logistics performance. Based upon the empirical evidence of this research, several RBL models are proposed for practitioners to understand and practice. This contributes to LSPs managing RBL and using appropriate RBL models to enhance greater logistics performance.

To attain the above research objectives, the following research questions are used.

1.4 Research Question

Guided by the above objectives, this research seeks to answer the following questions:

RQ1: What are logistics resources acquired by LSPs?

RQ2: What are the LSP logistics performances and the impact of logistics resources acquired by LSPs on such performances?

RQ3: How are these logistics resources affecting the logistics performances of LSPs?

RQ4: How to manage these logistics resources to achieve a high level of logistics performances?

The first research objective is achieved by the answers to research question RQ1. The second research objective is achieved by research question RQ2. The third research objective is answered by research questions RQ2 and RQ3. Finally the fourth research objective is answered by research question RQ3 (partly) and RQ4. The reviews on logistics and strategy literature and interviews with logistics managers are applied for answering RQ1 and RQ2. The survey is applied for answering RQ1 to RQ4. The research uses the literature review, interviews and survey questionnaire for answering RQ4.

1.5 Significance of Research

This research aims to address some of the above knowledge gaps identified previously in Section 1.2. It mainly contributes to the detailed understanding of the logistics resources acquired by LSPs and their performance impacts. The significance of this research is outlined below:

RBL definition: The final identification of logistics resources and capabilities acquired from literature and logistics expert interviews contributes to the RBL definition - tangible and intangible resources and capabilities acquired, developed and provided by LSPs to enhance logistics performance. This provides evidence on the RBL acquired by LSPs.

RBL and logistics performance constructs: This research contributes to the logistics literature on the development of the conceptualization and measurement of RBL and logistics performance constructs. The exploratory factor analysis provides factors for RBL – advanced physical and technology resources (tangible) and relational resources, organizational resources and management expertise (intangible); and for logistics performance – customer service innovation and cost leadership.

The RBL theoretical framework: Third this research contributes to development of a theoretical framework on the relationship between RBL and logistics performance. It makes a significant contribution to theory building for strategy and logistics literature. This builds understanding and knowledge about LSP logistics performance in relation to RBL as determinants.

The empirical testing of the RBL model: The correlation and simple regression results provide evidence on the extent of RBL acquired by LSPs and the ability of each RBL to predict logistics customer service innovation and cost leadership. Thus the results support the core theoretical framework which links the RBL variables to logistics performance.

The empirical exploration testing of the RBL model: Applying stepwise regressions on the RBL model identifies the best predictor for customer service innovation and cost leadership. From the theoretical foundation this research contributes to a pioneer empirical result on the RBL model which determines LSP logistics performance and competitive advantage. The implications of the RBL model on logistics performance are that LSPs need to acquire and provide higher organizational and physical resources as these are the main contributors in customer service innovation; and higher organizational and management expertise resources as these are the main contributors in cost leadership. The significance of these results leads to the post-hoc analyses which propose and validate that these contributors play a significant role in determining the impact of RBL on logistics performance.

The proposed RBL model: The four different models are provided for LSPs to improve their logistics performance. The implications of the models on logistics performance are that LSPs need to know what they are required to bundle and what they have to do in order to improve performance.

1.6 Scope of Research

This research is intended to be the first step in a plan of inquiry on resource based logistics and its constructs. The goal is to arrive at well-defined, valid, reliable and objective instruments to assess the variables of RBL and LP.

This research will be conducted on Malaysian companies within the logistics service industry. The target population will include all logistics service providers. However it is beyond the scope of this research to do the investigation in all LSPs in Malaysia. Thus the sampling frame for this research will be obtained from the Malaysia Logistics Directory (www.msialogistics.com).

1.7 Structure of the Thesis

This research is composed of nine chapters. The remainder of the research is as follows.

Chapter 2 reviews the literature of the logistics service industry and the studies of logistics resources. The logistics resources studies discuss the user and provider perspectives on logistics resources, the conceptualization of RBL, for example, RBL definition and parts of RBL, the conceptualization of performance, the performance impacts of RBL and the underlying theories of studies in RBL. This helps to gain an understanding of the historical development of theories and evidence of logistics studies on logistics resources and their performance impacts. The chapter also presents the strategy and logistics literature that has been reviewed in this research.

Chapter 3 develops theoretical frameworks and hypotheses. This chapter identifies, conceptualizes and measures the constructs of RBL which will have an impact on performance. Based upon an extensive literature review, and interviews, the following RBL are identified, conceptualized and measured: technology, physical, relational, organizational and management expertise resources. Next, LSP logistics performance is measured with multidimensional performance: customer service, service innovation and cost leadership. Finally the theoretical framework is established. This chapter explores the main and bundle effects of RBL on logistics performance and subsequently proposes research hypotheses which explain such effects.

Chapter 4 presents and defends the methodology used in this research. An interview and survey methods are used to achieve the research objectives and provide answers to the research questions. This research employs two methods of data collection: interview and survey. The chapter, next, presents the research instrument which includes the constructs and measures for RBL and logistics performance and the questionnaire design. Finally, this chapter presents and elaborates data analysis techniques applied before and after testing the survey data.

Chapter 5 presents the interview findings. This chapter provides the data gathered from face-to-face interviews with seven Malaysian logistics companies and its findings. The company profiles are described and analyzed by using content analysis. Overall, the interview data provides information on logistics resources acquired and its characteristics by Malaysian LSPs. This chapter offers a description of the general characteristics of RBL and the construct of RBL for the questionnaire development. This chapter thus provides an answer to mainly research question RQ1 and partly RQ2.

Chapter 6 presents the survey findings in terms of descriptive statistics and constructs validity. It first elaborates the general characteristics of samples – i.e. response rate, sample and respondents profiles, logistics resources acquired and its characteristics and logistics performance measures in terms of financial and non-financial performance. The chapter, next, presents the preliminary analysis of the survey data such as factor analysis, construct validity and reliability, correlations among constructs, and test of differences. This chapter thus provides answers to research questions RQ1 to RQ2.

Chapter 7 presents the testing of hypotheses based on analyses of survey data. The first set of hypotheses is examined by simple linear regression analysis on the direct relationship between each RBL and logistics performance in terms of customer service innovation and cost logistics. The second set of hypotheses on the impact of RBL bundles on logistics performance is tested by stepwise regression analysis. Next, this chapter presents the post-hoc analyses for the bundling and mediation effects of RBL on logistics performance by conducting the hierarchical regression analysis. The results presented in this chapter answer research questions RQ2 to RQ4.

Chapter 8 presents the discussion and implication. This chapter presents the comprehensive discussion on the findings based on the results from data analysis and hypotheses testing. This chapter present the RBLs and its components, the impact of RBLs on logistics performance, managing appropriate RBLs and the proposed RBL framework. This chapter presents the answer to research questions RQ1 to RQ4 to achieve the four objectives set of this research. The discussions are supported by theory and literature. This chapter offers novel evidence of managing RBL bundling for future research.

Chapter 9 presents a conclusion of this research. This chapter presents the summary of the findings, contribution to theory and practices and the limitation and future research. It summarises the main issues – e.g. the RBL acquisition by LSPs, the construct and measure of RBL and logistics performance; and the extent of the impact of RBL on logistics performance (the direct and bundling effects). Based upon the discussion of the results, this chapter presents the contribution and implications for theory building, empirical evidence and managerial issues for practitioners. The proposed managerial implications help LSPs to develop capabilities in five RBL, to bundle and manage RBL to improve and enhance logistics performance. Limitations of the research are then presented and directions for future researched are suggested.

CHAPTER 2: LITERATURE REVIEW

The firm-specific or idiosyncratic resources are real sources of a firm's success

2.1 Introduction

This chapter begins with an overview of the logistics service industry and a review of logistics resources studies. This chapter reviews logistics resource studies from user and provider perspectives, followed by the conceptualization of resource-based logistics (RBL) and logistics performance, the performance impacts of RBL, and the underlying theories of studies in RBL. The review of literature covers the strategic and logistics literature.

2.2 Logistics Service Industry

Logistics is a movement from one point to another. It was first defined by American Association (AMA) in 1948 as "the movement and handling of goods from the point of production to the point of consumption or use" (Hesket et al., 1973). Logistics was started at a time when men could produce more clothes and foods than they could consume. Therefore, there was a need for the distribution of extra products from place to place. The distribution of excess goods encourages the development of transportation infrastructures, such as railways, for larger and heavier goods, and roads to get goods to the desired place easier and faster. The main objective of logistics is to supply products to the customers in a satisfactory manner, supplying the right product to the right places at the right time with minimum cost.

The Council of Supply Chain Management Professionals (CSCMP), a professional organization for logistics personnel, formerly known as the Council of Logistics Management (formerly the National Council of Physical Distribution Management), defines Logistics Management as a "process of operations that includes transportation, inventory management, warehouse, distributing of physical goods, packaging, and even customer services" (www.cscmp.org). The providers of these services are called logistics service providers and discussed next.

Logistics service providers is a term used to describe different forms of logistics service providers, often interchangeable with terms such as "integrated logistics providers" (full and integrated logistics services) (Africk and Calkins, 1994) or in general "full service providers" (FSP) (Lai, 2004). Logistics service providers (LSPs) are providers of industrial logistics services that perform logistics functions on behalf of customers (Coyle et al., 1996; Delfmann et al., 2002; Panayides, 2007a) or as companies that specialize in providing various types of logistics services such as transportation, warehousing and freight forwarding (Murphy Jr & Wood, 2004). Lai et al. (2004) suggest that LSPs, often referred to as third party LSPs (3PLs), carry out the logistics activities for one or more companies within a supply chain (functioning as an intermediary). These definitions are further expanded by Ellinger et al. (2008) who describe LSPs or 3PL as firms that specialize in managing a wide range of service-related logistical activities for clients, including warehouse management, shipment consolidation, customs brokerage, transportation/distribution management and customer service (Daugherty et al., 1998; Mentzer et al., 2000). The use of third party-party logistics means the involvement of an external organization that performs all or part of a company's logistics function (Coyle et al., 2003) such as transportation, warehousing, and inventory management (Knemeyer and Murphy, 2004).

Logistics management has become the strategic factor which provides the competitive advantage for firms in global market (Bowersox et al., 2007). Consequently LSPs play an important role in global supply chain management (Lai and Chen, 2003; Lieb and Bentz, 2005; Fabbe-Costes et al., 2009). The logistics service industry has been experiencing growth since 1990 (Sheffi, 1990) showing a new trend has begun in the logistics industry which represents a significant part of the economy (Murphy Jr and Wood, 2004).

In particular LSPs play prominent roles in facilitating the export and import trades for organizations and manufacturers of the nation. The following explain that the positive growth in a nation's economy development (particularly in Malaysia) influences the positive demand in logistics services.

> *As reported by Bank Negara, the Malaysian economy growing by 4.5 to 5.5%, while the Malaysia Institute of Economic Research expects a 5.7% growth and the World Bank, 5.2% growth. In March 2010, Malaysia's exports recorded a strong growth of 36.4% (RM59.4 billion), while imports also rose by 45.4% (RM45.1 billion) compared to the same period in 2009). Thus in 2010 Malaysian economy is set for positive growth therefore the industry for logistics in Malaysia reports to be looking good as compared to a year ago (www.msialogisitcs.com).*

Due to the globalization of supply chain and firm outsourcing the demands for LSPs have been increasing (Ellinger et al., 2008). Therefore the LSP role is expanding rapidly as the number of firms outsourcing their logistics function to LSPs has increased (Lai et al., 2008). These have expanded the scope and role of LSPs in the supply chain from transport business to logistics service provider business. LSPs have been developing and integrating several logistics networks of manufacturers, retailers, transportation carriers, and final customers (Ellinger et al., 2008). Despite the increasing importance of LSPs in global supply chain management, little logistics literature has focused on understanding the roles and competitive advantages of LPSs (Fabbe-Costes et al., 2009; Wong and Karia, 2010).

Therefore it is essential to research LSPs which specialize in various types of logistics activities such as warehousing, transportation and freight forwarding (Fabbe-Costes et al., 2009). The increasing trends of logistics outsourcing have brought a challenging task for LSPs to meet new customer requirements and forced them to strengthen their resources and capabilities to enhance their performance (Yang et al., 2009).

The survey conducted by Langley and Capgemini (2007) reported that many logistics service users are, overall, dissatisfied with services provided by their LSPs. The survey reported that many LSPs failed to deliver the expected cost reduction, trustworthy relationship and increasing needs for wider portfolio of logistics services, geographical coverage and advanced information technology (Langley and Capgemini, 2007). Therefore, it is essential for LPSs to find the right strategic positioning (Hertz and Alfredsson, 2003) or innovations in providing logistics services (Chapman et al., 2003) in order to compete in the new competitive environment.

Due to the emerging demand of advanced logistics services, LSPs have been looking for appropriate strategies to improve their logistics services. LSPs may have to compete with different strategic development for different levels of logistics outsourcing (Hertz and Alfredsson, 2003), apply different strategic orientation (Yeung et al., 2006), develop new resources (Chapman et al., 2003), adopt new information technology (Lai et al., 2005) or improve market orientation (Ellinger et al., 2008) to remain competitive. LSPs may be required to adopt a different strategy (Yeung et al., 2006) or operations strategy (Lowson, 2003), collaboration, continuous improvement, E-operations and virtual logistics (Lowson, 2003). It is important for LSPs to consider these different approaches in order to attain sustainable competitive advantage through operating at lower cost, doing better than other players and undertaking a different strategy for different levels of LSPs.

The successful implementation of any strategy requires the acquisition and development of resources and capabilities. Thus, some previous logistics research has attempted to focus on the study of the logistics resources and capabilities which may enhance firm performance and competitive advantage. Tangible and physical resources such as logistics and IT equipment and facilities and technology (Lai, 2004; Yang et al., 2009), human resources (Ellinger et al., 2008; Wong and Karia, 2010), relational resources (Panayides and So, 2005a; Panayides, 2007a & b) and organizational resources (Brah and Lim, 2006; Yang et al., 2009) have previously been identified. It is argued that these logistics resources and capabilities are essential for LSPs to gain access to and transform the right resources into superior logistics performance and to sustain competitive advantage (Yang et al., 2009; Wong and Karia, 2010).

2.3 Review of Logistics Resources Studies

The study of logistics outsourcing and third-party LSPs has basically two distinct stages of development. In the first stage of development, the logistics literature has been focusing on understanding the determinants of logistics performance from a manufacturing industry and retailer perspective (e.g. Bowersox and Daugherty, 1995; Closs et al., 1997; Larson and Kulchitsky, 1999; Closs and Xu, 2000; Ellinger et al., 2002; Lowson, 2003; Sanders and Premus, 2005), as summarized in Table 2.1. In contrast, the second stage of logistics literature has shifted from the understanding of logistics resource from the user perspective to the logistics provider perspective, as summarized in Table 2.2. The growth of the logistics industry is, perhaps, the explanation for the increased number of studies from the provider perspective (e.g. Chapman et al., 2003; Mentzer et al., 2004; Vaidyanathan, 2005; Stefansson, 2006; Fabbe-Costes et al., 2009; Wong and Karia, 2010). Studies from these two perspectives are reviewed in the following sections.

2.3.1 User perspective on logistics resources

The early stage of logistics literature focuses on the understanding of logistics functions and performance from the user perspective (such as manufacturing firms or retailers); very few studies are from the buyer-provider relationship perspective see Table 2.1). Among this literature, some scholars propose frameworks for logistics that may enhance system effectiveness and efficiency (Novack et al., 1992; Closs and Thompson, 1992). Some literature considers resource management (facilities, people and financial) issues and examines decision and process that allow a firm to allocate and manage productive inputs or resources to maximize contribution to a firm (Novack et al., 1992). Meanwhile Closs and Thompson (1992) suggest that physical assets such as logistics infrastructure (facilities, movement hardware and inventory) and resources (production and distribution facilities and transportation) are essential for system effectiveness and efficiency.

Other literature investigates the extent of logistics management practices and experiences in firms. For example, the La Londe and Master (1994) survey of 208 US firm logisticians concludes that information technology, high trust, shared data and establishing close coordination may lead to quick response and customer satisfaction. Based on a case study and a survey of 45 Taiwanese retailers, Chiu (1995) identifies good planning of logistics systems, well-designed distribution organization, prudent selection of allied companies, close relationship with trading partners, logistics investment, the elimination of barriers to logistics management, the commitment of top management and continuous improvement as effective logistics management practices. Chiu (1995) also highlighted the importance of integrating IT with logistics management practices.

Some scholars focus on studying the logistics performance impact of resources and capabilities (Myers et al., 1996; Larson & Kulchitsky; 1999; Skjoett-Larsen, 2000; Lowson, 2003; Sanders and Premus, 2005; Shang and Marlow, 2005). Myers et al. (1996) studied the efforts of US firms in supporting their manufacturing logistics performance. Their survey of 197 corporate managers from manufacturing firms reveals that logistics performance is highly dependent on the availability of useful information (Myers et al., 1996). Meanwhile Larson & Kulchitsky (1999) examined the impact of logistics improvement programs (technology, relational and analytical programs) on logistics performance. Their survey of 209 Canadian logistician firms showed that the logistics programs including technology tools, for example, an EDI, relational programs which build more cooperative relationships and analytical programs such as 'JIT' tend to improve performance in terms of relations, customer service, efficiency and flexibility.

In the era of advanced technology scholars have begun to consider the importance and adoption of IT in logistics. Lowson (2003) argues that resources and capabilities such as collaboration, continuous improvement, E-operations, and virtual logistics may enhance firms' sustainable competitive advantage. In addition, the author suggests that better technologies, superior inputs, better trained employees, more effective management structures and strategic positioning will enhance a firm's performance in terms of achieving lower operating costs, and doing things better and differently than competitors (Lowson, 2003). Furthermore, Sanders and Premus's (2005) survey of 245 manufacturing companies in the US indicates that IT leads to performance, and both internal and external collaboration lead to performance such as cost, quality, delivery and new products.

However, the above studies are predominately from the perspective of the user but not the LSP perspective (Gunasekaran and Ngai, 2003; Wong and Karia, 2010). Another problem is that the above studies on logistics performance have been conducted with different units of analysis. This makes the evaluation of the logistics performance impacts of logistics resources and capabilities impossible. Another limitation is that these studies do not explain what constitutes the total logistics resources and capabilities acquired by LPSs. Very few of these studies define, conceptualized and measure such logistics resources and capabilities. Given logistics literature has a lack of theoretical background to identify and justify the constructs and measures for total logistics resources; hence SEM (structure equation model) is not appropriate to be used in this research. In the current literature, SEM is applied for established theoretical constructs such as relationship orientation (Panayides and So 2005a & b, Panayides, 2006, 2007a & b) but no for total LSP's resources.

Table 2.1: Summary of literature on logistics resources from the user perspective

Author	Resource distinctive characteristics	Performance	Perspective
Novack et al. (1992)	First dimension – physical activities (manufacturing , transportation, warehouse and physical distribution) Second dimension – transaction activities Resource management – decision and process that allow firm to allocate and manage productive inputs that maximize contribution to firm (facilities, people and financial)	Present a conceptual framework for logistics Customer satisfaction, value attainment, quality focus an d control system	Conceptual study
Closs and Thompson (1992)	Physical assets- <u>Logistics infrastructure</u> (facilities, movement hardware and inventory) Resources – production and distribution facilities and transportation	System effectiveness and efficiency Effective service Cost	Exploratory study
La Londe and Master (1994)	Information technology (Bar code, EDI) High trust (buyers and sellers, shippers, carriers and warehouse) Share data and attempts to establish close co-ordination	Quick response Customer satisfaction or desire Close coordination can produce high levels of service performance while reducing the total costs incurred.	User 208 senior logistics executive (US firms) Cross-tabulation
Chiu (1995)	Logistics management system: Logistics system's planning, distribution centre/organization IT integration with logistics management concept (EDI) Commitment of top management and continuous improvement Close relationship with trading partners	Performance: Financial (inventory turnover rate, picking error, cost ratio)	45 CEOs Taiwanese retailer Analysis: Suggestion and report
Daugherty and Pittman (1995) Time-based strategies	Closer relations with vendors and customers Communication/information Prerequisite for doing business (EDI) Extensive information exchange Capability to customize or tailor services, Create distribution flexibility or responsiveness	Competitive advantage Time management Faster response Customer service – high quality service Error-free shipment Superior communication support 'Not all customers are equal'	User – firms and distribution executives from 10 Fortune 500 firms Explorative study: In-depth interviews
Hammant (1995)	Information technology:	The important of IT in logistics	User

	Hardware and communication technology Integration & flexibility, EDI,	To deliver competitive advantage Reduce cost Increase productivity Improve customer service	Reporting the technology used in logistics operations
Kahn and Mentzer (1998)	Collaboration Interaction	Positive relationship between collaboration and performance Interaction not related to performance Collaboration and interaction lead to performance	514 firms Performance Analysis: regression
Sink et al. (1996)	Competence - 3PL with experience, focus and expertise, repurtation Capability – 3PL have financial, information system (EDI), technical competence Other issue – confident and trust, reputation (ability to provide required services or tailor to a customer's specific needs) Function of logistics - transportation, warehouse, packaging equipment Inventory management system, order processing, information system,	Buyer's expectation Outsourcing – reduce cost, enhance flexibility, and improve customer service Customers needs and solution to improve business process and beneficial to both parties "tailored or custom-made service" "buyers are more likely to be seeking the solution for a singular need or fulfilment of a specific task"	US Buyer's view of 3PL service and providers in the USA Exploratory study: focus group, depth interviews and mail survey Triangulated research
Myers et al. (1996)	Technology Organizational	Logistics information Strategic planning logistics performance is highly dependent on the availability of useful information	User 197 manager of firms Correlation
Drew and Smith (1998)	Developing people: learning help logisticians develop system thinking, information sharing and collaborative teamwork skill		User
Larson and Kulchitsky (1999)	Logistics improvement programs: Technology Program (advances in computer technology) – logistics people must be well versed in technology tools. e.g. EDI Relational program – to build more cooperative relationship Successful partnership = cooperation, collaboration, information	Performance: relations, customer service, efficiency and flexibility Technology and analytical program tend to improve performance	User survey on 209 Canadian logistician (firms) Analysis: factor analysis,

	sharing and trust Analytical program (JIT,	Relational program improve cooperative and performance.	t-test, LSD
Skjoett-Larsen (2000)	Access to information Service improvement Management commitment on investment in human resources and change in attitude	Success of 3PL Cost efficiency Increase Service and flexibility Suggest that human resources, speedy and reliable access to information and management commitment are crucial for the success of 3PL	3PL user Cases of 3PL
Murphy and Poist (2000)	Key success factor in 3PL relationship Cost saving, customer orientation, dependability, emphasis on long term relationship, focus on competency, improve service, management expertise (provider employs experienced professionals to manage all aspects of supply chain), mutual and trust, provider's knowledge, sharing relevant information and total organizational involvement	High degree of similarity between two groups Two most important – customer orientation and dependability. Suggest the important of effective and ongoing communications between parties. Should be collaborative – to anticipate customer needs and deliver solutions to problems and issues as they emerge	View of 51 3PL providers and 68 users of 3PL Correlation
Bharadwaj (2000) RBV IT resources	Independent variable: IT capability • IT infrastructure: **physical IT** assets-computer and communication technologies, technical platform and database • Human IT resource: technical IT **skills**; managerial skill • IT-enabled intangible (**organizational resources)** – the emphasize on customer orientation, better coordination, increase responsiveness	Financial performance Data from compustat database IT capability lead to improve performance	Sample: 56 IT leader firms Case example IT leader (Wal-Mart and Federal Express corporation) Develop the concept of IT as an organizational capability
Alshawi (2001)	The adoption of IT Technology based resources: hardware, software, peripheral and	The conceptualization of technology IT describe the convergence of	User Conceptual study

	communication system	computers, telecommunications, electronics and resulting technologies	
House and Stank (2001)	Logistics partnership Formal and informal communication strategy (build a bridge between organization)	Reduce total logistics cost Reduce transit time Improve information and pipeline reliability 3PL can help a firm to achieve substantial results	User Case study Leading retailer in USA and international 3PL
Ellinger et al. (2002)	Learning behaviour Developing learning skill and harnessing knowledge of employee	Firm performance Leaning behaviour is related to customer service-related performance indicators (response time for customer complaint, customer satisfaction, number of suggestions implemented and number of individuals learning skills)	User 208 firms A series of regression
Lowson (2003) RBV Define resource – a basic element Competencies – the fundamental knowledge owned by firm (knowledge, know-how, experience, innovation and unique information Capabilities – reflect a firm's ability to use its competencies and refer to the dynamic routines acquired by the firm – the managerial capacity to improve continuously the	Operations strategy Collaborative Continuous improvement E-operations, virtual logistics Better technologies, superior inputs, better train employees, more effective management structure Strategic positioning (different services)	Sustainable competitive advantage -achieve by operating at lower cost -doing better than competitor -doing things differently	User Exploratory study

effectiveness of the organization			
Aldin et al. (2004) RBV	Electronic commerce EDI, electronic commerce or IT solution, email interaction and Internet transaction. Response to customer needs, create mix or unique value Close relationship with its customers	All companies interact via e-mail and dialogue forms and transact via internet to the extent that they sell, receive and confirms orders Company significant progress – cost reduction, shorter lead time Integrate progress, change structure and increase value added	User Exploratory study Case study- semi-structure face-to-face interview with general, marketing and logistics managers at the case companies
Stank (2003)	Relational performance: Know customer needs well, cooperates with customer to help do the job well, continuous improvement on ongoing basis	Logistics service performance in firms Operational, and cost performance Customer satisfaction that lead to loyalty and turn to market share Relational performance is positively related to operational performance, cost performance and customer satisfaction	User 111 firms (different industry) SEM
Knemeyer and Murphy, (2004)	Trust Communication Reputation	Perceived the performance of 3PL Buyers and 3PL relationship Reduces logistics cost Increase customer support Reduce cycle time Improve logistics system responsiveness Communication is related to operation performance Trust is related to operation performance	User 388 US logistics professional Analysis SEM

Vaidyanathan (2005) Framework for 3PL with advanced IT	Material Flow: Transportation, warehousing (packaging, labelling) Information flow for global inventory management and logistics Customer service	To evaluate 3PL IT capabilities Quality Cost Services Performance metrics Intangibles	User (survey on Fortune 500 companies) Evaluate 3PL
Sanders and Premus (2005) Logistics literature	IT capability to acquire, process and transmit information Internal and external collaboration	Firm performance -cost -quality -Delivery -new product IT leads to performance IT lead to internal and external collaboration External lead to internal collaboration Internal collaboration lead to performance	245 US manufacturing firms Analysis: SEM
Min et al. (2005)	Collaboration	Performance: Efficiency, effectiveness, profitability and market position	55 firms (29 manufacturers, 113PL and 5 retailers) Survey, interview and literature to develop a conceptual model
Shang and Marlow (2005) RBV Logistics literature	Information-based capability -information IT -information sharing	Logistics performance -provide and respond to customer needs -meet delivery date -provide new product	198 manufacturing firms Analysis: SEM

		Information-based capability (logistics capabilities) is related to logistics performance	
Huang et al. (2006) RBV of IT Other literature	Independent variable: IT capability • IT infrastructure: physical IT assets-computer and communication technologies, technical platform and database • Human IT resource: technical IT skills; managerial skill • IT-enabled intangible (organizational resources) – the emphasize on customer orientation, better coordination, increase responsiveness	Financial performance: ROA – return on asset ROS – return on sales IT infrastructure is related to IT enabled intangible Human IT is related to IT enabled intangible IT enabled intangible is related to firm performance	Sample 155 industry firm (Taiwan) Analysis: EFA and regression
Wu et al. (2006) RBV IT-enabled supply chain capabilities are firm specific	Information technologies on supply chain capabilities Independent variable: IT alignment IT advancement Mediating variable: Supply chain capabilities (SCC) – organizational capabilities (combine resource using information-based organizational process	Firm performance: Financial performance (FP) Marketing performance (better than competitor in sales growth, market share and development, product) (MP) IT related resources (IT alignment and advancement) are related to SCC SCC lead to FP and MP	184 firms in various industries URL link to web-survey

Table 2.2: Summary of literature on logistics resources from the provider perspective

Author	Resource distinctive characteristics	Performance	Perspective
Gunasekaran and Ngai (2003)	Transportation (shipping) Inventory management Information technology (method and technologies employed): internet, EDI and ERP Strategic planning Capacity planning	Success of the company: Customer satisfaction Repeat customer visits to clients Responsiveness to clients and customer requirements Partnership, customer relationship	Small 3PL in Hong Kong Analysis: A case study of one logistics company
Chapman et al. (2003) A view from Transportation company to LSP	Service innovation (Kandampully's 2002) require: Advanced technology – ICT via internet Relationship network – collaboration, coordination Knowledge –seek new knowledge and expertise	Identify new resources within new business model Service innovation – Think for customer anticipate and innovate services to meet customer evolving need	Analysis: Conceptual paper
Mentzer et al. (2004) Framework for LSP RBV	Resource management Tangible: plants, equipments raw materials, distribution centres and logistics network Intangible: relationships, corporate culture, management skills, knowledge, logistics expertise, logistics services, customer loyalty 3	Logistics capabilities Customer service, logistics quality Low cost distribution and supply Information sharing and technology connectivity Proposed: the management of the overall resources of the firm leads to distinctive logistics capabilities Proposed: Logistics capabilities help firm achieve competitive advantage (cost reduction and customer service)	Conceptual paper
Piplani et al. (2004)	The use of Information technology (IT)	More providers attempt to incorporate IT Suggestion to become 3PL – logistics companies are expanding their scope of services (inventory management or order processing) Acquiring new knowledge, skill and technology to differentiate themselves from competitors	Survey on 65 3PL Descriptive

Panayides (2004) RBV	Market orientation [resource based strategy (Hunt and Morgan, 1995)] Customer orientation Competitor orientation Inter-functional co-ordination	Business performance Profitability Sales volume Market share Overall performance ROCE Market orientation (customer and competitor orientation) is not significant to business performance	208 LS in Asia, North America and Europe
Lai (2004) RBV –high resource and capability lead to better performance	Service capability Value-added logistics service: Assembling, repackaging, warehouse and EDI linkage Technology-enabled logistics service: Information system management, tracking and tracing shipment information, web-based linkages, Receiving/sending shipment notices: advanced ship notice (ASN) through EDI Freight forwarding service (FFD)	Service performance measures (solve problem, response, handling complaints) Cluster analysis: Full service provider, traditional freight forwarders and transformers Full service provider achieve high level of value added logistics service, technology enabled and FFD	232 General manager LSPs in Hong Kong Cluster analysis
Lai et al. (2005)	IT adoption IT usage in inventory and location control, managing flow of orders and process Knowledge and Expertise in IT (resource of expert)	Perceived benefits Quick response and access to information Improve customer service Enhance competitiveness Reduce data entry, error, paperwork, manpower IT improve efficiency Use internet as communication platform to facilitate the logistics information Intranet used to share shipping status, inventory and order status information EDI increase the degree of accuracy	195 LSPs in Hong Kong One-sample t-test Interview five respondents LSPs

Panayides and So 2005a Relational Logistics literature	Relationship Orientation (RO): Trust Bonding Communication Share value Empathy Logistics service quality (LSQ) (Reliability, responsiveness, accuracy, service, problem solving, empathy)	Performance Profitability compared to business and industry average Market share compared to business and major competitor RO has positive influence on performance RO has positive influence on LSQ LSQ has positive influence on performance	Sample: 251 LSPs in Hong Kong Analysis: SEM
Panayides and So (2005b) Relational Provider-clients RO Logistics literature	Relationship Orientation: Trust Bonding Communication Share value Empathy	Supply chain performance (cost and improve cash) Innovation service Relationship is related to Supply chain performance (cost and improve cash) Relationship is not related to innovation	Sample: 251 LSPs in Hong Kong Analysis: SEM
Panayides (2006) Relational Logistics literature	Relationship Orientation: Trust Bonding Communication Share value Empathy Organizational learning – commitment to learn	Performance: financial performance Relationship is related to innovation Relationship is related to logistics service quality (LSQ) Innovation lead to LSQ LSQ lead to performance	Sample: 251 third-party logistics service providers in Hong Kong Analysis: SEM
Panayides (2007a) Relational Logistics literature	Relationship Orientation: Trust Bonding Communication Share value Empathy Organizational learning – commitment to learn	Supply chain effectiveness (customer service) Relationship is related to customer service	Sample: 251 third-party logistics service providers in Hong Kong Analysis: SEM

Brah and Lim (2006) Logistics literature	Automated material handling equipments, automated storage Data handling hardware (barcode, LAN) software (EDI), Managerial practice (TQM) – top management leadership, customer focus, quality focus, human resource, strategic planning, information system and analysis	Performance: Overall performance Operational performance: cost customer service, delivery, quality, flexibility and service process quality Quality performance – attitude towards customer Technology performance – frequency use	81LSPs in Singapore Analysis: correlation and t-test analysis
Lai et al. (2006)	IT focus: Having advanced IT and modern IS Improving IS & IT Managerial effort IT competency	Firm competitive advantage: Costs advantage Service variety advantage Service quality advantage IT has significant impact on 3PL firm's service and quality advantage and cost advantage	105 3PL in China Analysis: CFA and spline regression
Stefansson (2006) LSP conceptual framework	Entities in logistics system: Goods, Vehicles Facilities and infrastructure LSPs provide services: standard, bundled and customized services The advanced service tend to be more customized	Reorganizing distribution structure lead to warehouse and transportation operations cost increase delivery performance LSPs in most cases are asset based as they possess trucks, trailers, handling equipment and warehouses, DC or terminal facilities	Case study Schenker, Dell, Kimberly and IKEA
Lin (2007)	Internal factor: Organizational encouragement Quality of human resource External factor: Environment uncertainty Government support	Performance: Innovation in logistics technologies Data acquisition technologies (bar code, RFID) Information technologies (EDI) Warehousing technologies (automated storage & retrieval system) Transportation technologies (GPS, GIS, radio frequency)	583 LSPs in China Analysis: multiple regression

		Organizational and environmental factor lead to innovation in logistics services	
Lin (2008)	Organizational factor: Organizational encouragement Quality of human resource Environmental factor: Environment uncertainty Government support	Performance: Innovation in logistics technologies (explicitness and accumulation of technology) Organizational factor (encouragement and human resource) lead to technology adoption (RFID)	142 LSPs in Taiwan Analysis: Multiple regression
Lai et al. (2008) RBV on IT capability in the 3PL industry	Information technology capability IT capability: Resource commitment Managerial involvement Technology orientation Technology orientation lead to resource commitment and managerial involvement Resource commitment and managerial involvement lead to IT capability	Firm competitive advantage: Costs advantage Service variety advantage Service quality advantage IT capability lead to firm competitive advantage	Survey on 105 3PL firms in China Analysis: SEM
Fabbe-Costes et al. (2009)	The important role of LSP (many ignore LSP in SCI)	Focusing on logistics outsourcing but ignore LSPs perspective Very few include LSP's perspective in their empirical studies	LSP Conceptual paper Literature documentation
Ellinger et al. (2008)	Marker orientation human resource attributes Training Coaching Empowerment	Organizational performance Employee performance Market orientation is positively related to employee and organizational performance Training moderated market orientation and employee performance Coaching moderated market orientation and employee and organizational performance	LSPs 123 dyads (81) North American 3PL organizations

Yang et al. (2009) Organizational Physical/technology Relational	Corporate image resource: corporate reputation, financial stability Information equipment resource: Cargo tracking system facilities, EDI facilities, internet service facilities Network resource: high frequency of sailing, geographical coverage of service Logistics service Service reliability Information integration Value added service capability Relationship building Innovation capability	Firm performance: Service performance (service quality, customer satisfaction, customer loyalty Financial performance (profit rate, market share, sales growth, ROI, reduce operation cost Resource has a positive effect on logistics service capability and innovation	123 Managers of Taiwanese container of shipping service firms Analysis: EFA, CFA & SEM
Wong and Karia (2010)	Logistics service centres, hubs, warehouses, land , road vehicles and aircraft Information resources – ability to provide information, automate processes and integrate information system Exclusive and long term trustworthy relationships leading to long-term contract: horizontal & alliances Skill and experience in relevant field Knowledge resources – any relevant knowledge	Financial performance Revenue Profit	15 largest global LSPs from the Datamonitor.com Analysis – documentation review

2.3.2 *Provider perspective on logistics resources*

As summarized in Table 2.2, some of the logistics literature from the provider perspective has attempted to conceptualize and measure various types of logistics resources and capabilities (e.g. Lai and Chen, 2003; Chapman et al., 2003; Mentzer et al., 2004; Stefansson, 2006; Fabbe-Costes et al., 2009), and examine the roles of physical and information technology in adding value and enabling logistics services (Lai et al., 2006; Lai et al., 2008). Some examine the roles of relationship orientation (Panayides and So, 2005a & b; Panayides, 2007a & b).

Since logistics companies are expanding their scope into services such as inventory management or order processing, they need to acquire new resources. For example technology, knowledge and relationship networks are new resources required to nurture innovation in logistics services (Chapman et al., 2003). Meanwhile from a case study of small LSPs, Gunasekaran and Ngai (2003) identify five factors i.e. strategic planning, capacity planning, transportation, information technology (IT) and inventory management that allow a small logistics company to become successful in its operation. The study argues that long-term relationships and partnerships, customer relationships and excellent feedback systems are essential for the long-term survival and prosperity of a company (Gunasekaran and Ngai, 2003).

Based on the Resource-based view (RBV) theory, Mentzer et al. (2004) proposed (but not tested) a framework for the LSP. The framework divides logistics resources into tangible and intangible resources. The study proposes that the management of overall resources of LSPs lead to some distinctive logistics capabilities which, in turn, help a firm to achieve competitive advantage in terms of cost reduction and customer services (Mentzer et al., 2004). Another framework for LSPs is proposed by Stefansson (2006), developed based on case studies of Schenker, Dell, Kimberly and IKEA. The study looks into the impact of logistics systems, which include elements of goods, vehicles, facilities and infrastructure to reorganize distribution structure, on warehouse and transportation operations cost reduction and delivery performance improvement (Stefansson, 2006).

The roles of logistics resources on logistics service capabilities of the LSP have been examined by Lai (2004). Lai (2004) conducted a survey on 232 LSPs in Hong Kong and categorized the samples into full service providers, value-added logistics service providers (warehouse, repackaging/labelling, order processing), technology-enabled logistics service providers (web-based, information systems, tracking/tracing), and freight forwarding service providers. In addition, the study reported that full service providers have higher scores on logistics service capabilities as compared to others indicating that such logistics service capabilities are essential for full service providers (Lai, 2004). Lai (2004) suggests that the collections of resources and capabilities lead them to successfully compete against other competitors.

More studies on the impact of logistic resources and capabilities on performance have been undertaken. Brah and Lim (2006) consider managerial practices such as top management leadership, customer focus, quality focus, human resources, strategic planning, information systems and analysis as essential quality management practices in LSPs. The survey conducted by Brah and Lim (2006) on 81 LSPs in Singapore report that such practices have positive correlations with operational performance.

As more and more providers attempt to incorporate or adopt IT, Lai et al. (2008) attempt to examine the impact of information technology capabilities (e.g. resource commitment, managerial involvement and technology orientation) on an LSP's competitive advantage such as cost advantage and service advantage. The survey conducted by Lai et al. (2008) based on 105 3PL firms (third-party logistics) in China indicates that IT capability enhances an LSP's competitive advantage.

Lin (2007) considers organizational and environmental factors as determinants for the technology innovation in the study of 583 LSPs in China. The literature indicates that organizational factors such as organizational encouragement and quality of human resources lead to innovation in logistics technologies (Lin, 2007). Lin (2008) also considers the same factors: organizational and environmental as determinants for the technology adoption in the study of 142 LSPs in Taiwan. Other studies examine the performance impacts of relationships. It is argued that relationship with customer and suppliers/vendors is essential for LSPs to understand customer needs and requirements (Panayides and So, 2005a & b; Panayides, 2007a & b). It is reported that relationship orientation is related to customer service (Panayides, 2007a & b), cost and improved cash flow (Panayides and So, 2005a), and innovation (Panayides, 2006).

In relation to LSP customer orientation, Ellinger et al. (2008) argue that market orientation creates value only in conjunction with human resource attributes such as training, coaching and empowerment. Their survey of 81 large LSP firms in the US based on 123 dyads report that the attributes of human resources such as training, coaching, and empowerment play as moderating roles in the relationship between market orientation and organizational performance. Their results of hierarchical multiple regression analysis reveal that coaching moderated the relationship between market orientation and employee performance and coaching also moderated the relationship between market orientation and organizational performance. Other moderator, training only moderated the relationship between market orientation and employee performance.

A recent study by Yang et al. (2009) examines the impact of the resources attributes (e.g. financial stability, corporate reputation, low damage and loss record and number of branch companies or agencies, cargo tracking system facilities, EDI facilities, internet facilities, high frequency of sailings, geography coverage of services), logistics service capabilities, and innovation capability on logistics performance of Taiwanese container shipping firms. Their survey of 123 managers of Taiwanese container shipping companies shows that the shipping companies' resources are factored into 'corporate image resource', 'information equipment resources' and 'network resources'. The study further concludes that such resources have a significant positive effect on logistics service and innovation capabilities, and logistics service capabilities have a positive effect on the performance of container shipping companies from Taiwan. However, resource and innovation capability are not found to have positive effects on firm performance.

One of the latest studies by Wong and Karia, (2010) presents comprehensive resources acquired by 15 major international LSPs. Based on documentation review the study identifies five groups of logistics resources - physical, information, human, knowledge and relational resources (Wong and Karia, 2010). This study provides us with an avenue for further investigation on the relationship between resources and capabilities and logistics performance.

The above studies suggest that logistics performance may be explained by firms' resources such as tangible or physical and IT resources, relationship, managerial competences and human resources and capabilities. To date studies undertaken by Panayides and So (2005a & b), Panayides (2007a & b), Brah and Lim (2006), Lai et al. (2008), Yang et al. (2009) and Wong and Karia (2010) are deemed most relevant to this research. These logistics studies provide some empirical evidences to support the arguments that resources and capabilities enhance the logistics performance of LSPs.

2.3.3 Conceptualization of RBL and logistics performance

Different authors have different views on the conceptualization of logistics resources and capabilities (refer to Table 2.1 and 2.2). According to Lowson (2003) resource is the basic element that a firm controls to organize its operations; competencies is the fundamental knowledge owned by firm (e.g. knowledge know-how, experience, innovation and unique information; and capabilities) which can be considered as the dynamic routines of a firm. In addition, Lowson (2003) defines capabilities as a firm's managerial capacity to continuously improve the effectiveness of the organization. Following Lowson's (2003) definition, resources acquired by LSPs consists of logistics resources and capabilities. There is a lack of literature that includes the perspective of LSPs in terms of logistics resources and capabilities acquired by LSPs.

Given the need for the study of logistics resources, there is still a lack of research which attempts to conceptualize and measure the construct of logistics resources. When conceptualizing logistics resources, some scholars do not differentiate tangible resources from intangible resources and capabilities (e.g. Lin, 2008; Yang et al., 2009). Some scholars focus on just one particular group of resources and capabilities, for example, relational resources (Panayides and So, 2005a; Min et al., 2005), information technology capability (Shang and Marlow, 2005; Lai et al., 2008), physical resources (Gunasekaran and Ngai, 2003) and human capital (Myers et al., 2004). Others divide logistics resources into tangible resources (e.g. equipment, plants, fleets, hardware), intangible resources (e.g. organizational processes, skills, know-how, reputation), and capabilities required to create or deploy resources (Mentzer et al., 2004; Lai, 2004).

The logistics literature has not been prominent in the application of a resource-based view (RBV) theory to understand resources, competencies and capabilities (Olavarrieta and Ellinger, 1997; and Skojett-Larsen, 1999). Based on the RBV theory, Olavarrieta and Ellinger (1997) consider resources and capabilities as the ‘logistics distinctive capability’ - a key strategic resource which is valuable, scarce and both difficult and costly to imitate. Following Olavarrieta and Ellinger (1997), Skojett-Larsen (1999) defines ‘strategic resource’ as the logistics competence in terms of vertical cooperation that bundles resources and capabilities. According to the RBV theory, these previous studies focus on the firm’s resources and capabilities which will create a sustainable competitive advantage if they are valuable, rare, inimitable and non-transferable.

Mentzer et al. (2004) have attempted to conceptualize tangible and intangible resources in logistics industry. Based on RBV theory, Mentzer et al. (2004) consider plant, equipment, raw materials, logistics network, and distribution centres as tangible resources; and relationships, corporate culture, management skills, knowledge, logistics expertise, logistics services and customer loyalty as intangible resources. The literature suggests that these tangible and intangible resources and capabilities may enhance logistics capabilities, for example, customer service, logistics quality, low cost, information management and coordination (Mentzer et al., 2004). Table 2.3 summarizes LSP resources and capabilities proposed by various authors.

Table 2 3: Summary of resource and capability attributes

Resource and capability attributes		Author
Tangible Mentzer et al. (2004) Plants, equipment, raw materials, technology, logistics network, and distribution centres		
Physical resources: Logistics infrastructure: movement facilities and hardware facilities	Physical assets: logistics infrastructure e.g. facilities, movement hardware and inventory Resources – production and distribution facilities and transportation	Closs and Thompson (1992)
IT infrastructure – Physical IT, asset-computer, communication technologies, IT tools (EDI)	Entities in logistics system: goods, vehicles, facilities and infrastructure Warehouse, transportation operations and packaging equipments	Stefansson (2006)
	Value-added logistics service (Assembling, repackaging, warehouse and EDI linkage)	Lai (2004)
	Logistics ICT – hardware, software and network design	Chapman et al. (2003)

	Physical IT assets –computer and communication technologies, technical platform and database	Bharadwaj (2000) (Management information literature) Huang et al. (2006) (Operations literature)
Technology resource: Advanced in technology, advanced in equipments, improvement in IT and facilities, information management system, up-to-date, and improvement in technologies, adopt sophisticated technology	Technology-enabled logistics service: Information system management (tracking and tracing shipment information) web-based linkages, Receiving/sending shipment notices: advanced ship notice (ASN) through EDI	Lai (2004), Lai et al. (2005)
	Hardware and software, peripheral and communication system	Alshawi (2001)
	Up-to-date technology Advanced technology – ICT via internet	Chapman et al. (2003)
	EDI, electronic commerce or IT solution, email interaction and Internet	Aldin et al. (2004)
	Advanced IS and IT Improvement in IS and IS	Lai et al. (2008)
	Improvement in technologies Adopt sophisticated technology	Lowson (2003) Wu et al. (2006)
	Advanced equipment and facilities: Automated material handling equipments, automated storage	Brah and Lim (2006)
	Information equipment resources	Yang et al. (2009)
Intangible (Mentzer et al., 2004) Relationships, corporate culture, management skills, knowledge, logistics expertise, logistics services and customer loyalty		
Management expertise resources: Inclination on Recruitment Hiring Training and education Skills Experienced Knowledge employees	Developing people with appropriate education and training	Drew and Smith (1998)
	Top management commitment on investment in human resource	Skjoett-Larsen (1999)
	Management expertise – providers employs experienced professionals to manage all aspects of supply chain	Murphy and Poist (2000)
	Firms hire or recruit people who have new skills, knowledge and quality	Poist et al. (2001) Razzaque and Sirat (2001)

	Knowledge –seek new knowledge and expertise Skill and experience in relevant field Human capital: education level, years of experience and skills 'Quality of human resources' which comprised of employee's ability to learn, to use technologies to solve problem, to share knowledge, provide new ideas Knowledge resources – any relevant knowledge	Chapman et al. (2003) Myers et al. (2004) Lin (2007; 2008) Wong and Karia (2010)
Relational resources: cooperative relationship, collaboration, communication, interact to understand customer needs, share relevant information	Close relationship with trading partners Partnership – cooperation, collaboration, information sharing and trust Relationship network – collaboration, coordination Partnership, customer relationship Communication Relationship network – collaboration, coordination	Chiu (1995) Larson and Kulchitsky (1999) Chapman et al. (2003) Gunasekaran and Ngai (2003) Panayides and So (2005a) Panayides (2007a & b) Chapman et al. (2003)
Organizational resources: Management commitment and involvement Know-how, corporate culture, corporate reputation, and environment orientation, synergy operation: To organize its organization or improve the effectiveness of its organization To understand performance, to develop and achieve strategy and objective To synthesize strategy into practices or routines To emphasize on customer orientation, anticipate their needs and deliver solutions to problems	Commitment of top management and continuous improvement Reputation - ability to provide required services or tailor to a customer's specific needs Strategic planning, repeat customer visit Managerial practice (TQM) Organizational encouragement Managerial involvement IT-enable intangible e.g. the emphasize on customer orientation, Corporate reputation	Chiu (1995) Sink et al. (1996) Gunasekaran and Ngai (2003) Brah and Lim (2006) Lin (2008) Lai et al. (2008) Bharadwaj (2000) Huang et al. (2006) Yang et al. (2009)

As indicated by the above table, the logistics literature is troubled with different views on the conceptualization of logistics resources and capabilities for LSPs. Furthermore, constructs and measurement scales for such logistics resources and capabilities have not been fully and theoretically established and empirically tested.

Despite fragmented views, logistics resources and capabilities can be broadly divided into tangible and physical resources such as logistics and IT equipment, and facilities and technology resources (Lai, 2004; Yang et al., 2009); and intangible resources such as human resources (Ellinger et al., 2008; Wong and Karia, 2010), relational resources (Panayides and So, 2005a; Panayides, 2007a & b) and organizational resources (Brah and Lim, 2006; Yang et al., 2009). Such resources and capabilities are discussed in the following sections.

2.3.3.1 Technology resources

The logistics literature often regards advanced technology, advanced equipment, information equipment, resources and information systems and improvement in information technology as technology resources. Chapman et al. (2003), from logistics literature, consider firms keeping pace with information age or up-to-date technology e.g. communication technology (ICT) via the internet as technology resources. The term of technology and IT resource is used in logistics literature interchangeably (Alshawi, 2001). The conceptualization of technology or information technology is regarded as technology-based resources such as hardware, software, and peripheral and communication system (Alshawi, 2001). Furthermore Aldin et al. (2004) consider communication technology as computer technology combined with telecommunication technology.

Lai (2004) considers ‘technology-enabled logistics’ service providers as those LSPs who have a high level of technology resources such as tracking and tracing shipment information, web-based linkages, receiving/sending shipment notices. Lai’s (2004) study of 232 LSPs in Hong Kong confirms that the above conceptualization and measurement of ‘technology-enabled logistics service’ were reliable. Yang et al. (2009) considers ‘information equipment resources’ such as EDI facilities, internet service facilities, and cargo tracking system facilities as technology resources. The study of

Yang et al. (2009) on 123 Taiwanese shipping containers confirms that the conceptualization and measurement of 'information equipment resources' were reliable.

Some scholars refer to advanced equipment and facilities including automated material handling equipments, automated storage and tracking systems, heavy-users of management technologies and more sophisticated logistics systems (Brah and Lim, 2006) as technology resources. These technology resources are regarded as innovations in logistics technologies, for example, data acquisition technologies (e.g. RFID), information technologies (e.g. EDI), warehousing technologies and transportation technologies (e.g. GPS, GIS). Panayides (2006) refers to 'firm innovativeness' such as investing in new systems and adopting new process as technology resources and capabilities. Meanwhile, Lai et al. (2006) refer to higher IT application (IT integrated into service products e.g. RFID) which may help firms reduce cost and improve service as technology resources and capabilities. Furthermore, Lai et al. (2008) use 'technology orientation' as synonymous with technology resources. Lai et al. (2008) found that the 'technology orientation' comprises of modern information systems (IS) and advanced information technologies (IT).

Since logistics firms need to adopt and update their technologies (e.g modern or advanced technologies), some scholars consider improvement in information systems and technology and its application to business operations as technology resources (Lowson, 2003; Lai et al., 2008). Wu et al. (2006) refer to IT advancement as the extent to which a firm adopts the most sophisticated technology. Meanwhile Lowson (2003) suggests technology resource improvement and maintenance as an important means to keep up with the most up-dated or advanced technology (e.g. information communication technology (ICT) via internet). Furthermore, Lai et al. (2008) found that 'technology orientation' involves 'resource commitment' which comprises improving information systems and technology and improving its application.

Technology resources receive a lot of attention because they are arguably important for LSPs to acquire, process and transmit information for achieving effective decision making (Sander and Premus 2005) and enabling information to be accessed and used by various parties in the logistics network to enhance logistics performance (Skjoett-Larsen, 2000; Brah and Lim 2006). Furthermore, technology resources enable LSPs quickly access important information (Lai at el., 2005). The literature indicates that the logistics business is driven by information flow (Alshawi, 2001) and most LPSs have adopted logistics information systems so that they can integrate all information to enable management to monitor inventory at all locations throughout the supply chain with multiple warehouses in multiple countries (Hammant, 1995; Lai et al., 2005). However, logistics literature does not have any universal definition for technology resources. Some scholars consider innovation or advancement in logistics technology (e.g. Chapman et al., 2003; Lai et al., 2008) which often regards intangible resources of technology. Other logistics scholars only consider advanced equipment (Brah and Lim, 2006) and 'information equipment resources' (Yang et al., 2009). Although some have reliable measurement scales they are developed for specific contexts of logistics companies which do not always apply to LSPs.

2.3.3.2 Physical resources

The logistics literature often regards physical assets such as logistics infrastructure, or logistics systems such as vehicles, facilities (warehousing, transportation, packaging equipment) and physical IT assets as physical resources. Closs and Thompson (1992) conceptualize 'logistics infrastructure' as logistics facilities, movement hardware and inventory. Closs and Thompson (1992) also refer to resources such as production and distribution facilities and transportation as physical resources. Stefansson (2006) conceptualizes 'entities in logistics system' which includes elements of goods, vehicles, facilities and infrastructure as physical resources. Terms such 'logistics facilities' and 'equipment' are often interchangeable (Stainer, 1997). These physical resources are often regarded as physical activities by Novack et al. (1992) from logistics literature.

Some scholars refer to the physical IT infrastructure components as important physical resources for LSPs. Chapman et al. (2003), from logistics literature, consider IT infrastructure as 'logistic ICT' which may include components such as hardware, software and network design. Similarly the information systems literature (Bharadwaj, 2000) and operations literature (Huang et al., 2006) refer to IT infrastructures as physical IT assets such as computer and communication technologies, technical platforms and databases and other support services as facilities of competitive advantage. These physical resources such as logistics and computer equipment and facilities are used to provide value-added for logistics operations and services. Lai

(2004) refers to ‘value-added logistics services’ such as assembling, repackaging, warehousing and EDI linkage as logistics services or facilities for LSPs. Lai’s (2004) study of 232 LSPs in Hong Kong confirms that the above conceptualization and measurement of ‘value-added logistics services’ were reliable.

The literature suggests that physical resources are used for goods/materials flow (performed movement e.g. transport vehicles, distribution centres or logistics networks, warehouses and vessels) and for information flow (e.g. Bowersox et al., 2007; Aldin et al., 2004). These logistics facilities and equipment are for activities such as inventory, transport and warehouse operations and packaging (Novack et al., 1992; La Londe and Master 1994; Murphy & Poist 2000; Gunasekaran, 2003; Bowersox et al., 2007; Stefansson, 2006). Physical resources are also required for the movement of inventory resources such as raw materials, work in process, or finished goods (Closs and Thompson, 1992). Those IT infrastructures, used for information flow, are meant to support logistics operations (Aldin et al., 2004). For example, Aldin et al. (2004) found that all logistics managers interact via e-mail interaction, dialogue forms and transact via the internet to the extent of selling, receiving and confirming orders.

Since physical resources are one of the most critical (competitive) resources for LSPs (Stainer, 1997), it is important for LSPs to gain access to these resources to maintain the control of logistics activity and to improve the reliability and speed of delivery (Karia and Razak, 2007; Wong and Karia, 2010). Physical resources are valuable for the movements of goods from one point to another because they allow LSPs to perform activities of the movement of goods (Wouthers and Sportel, 2005). Previous studies suggest that physical resources have resulted in considerable savings such as decreased inventories, decrease in warehouse operations and transportation costs and increased delivery performance (Stefansson, 2006).

The physical resources are essential for LSPs to support logistics services and administration. However they have not been conceptualized and measured for LSPs. Some logistics scholars refer to logistics infrastructures, such as facilities and equipment for warehousing, inventory and transportation (Closs and Thompson, 1992; Stefansson, 2006) as tangible and physical resources for LSPs. Some refer to IT-infrastructures, such as value-added logistics service (Lai, 2004), logistics ICT

(Chapman et al., 2003) and physical IT-assets, as physical resources which enable logistics facilities as competitive advantage.

2.3.3.3 Management expertise resources

The logistics literature often regards human capital, for example, skills, experience and education; knowledge resources, hiring management expertise, and provision of training and education as management expertise resources. Although management expertise resources have not been established in logistics literature some scholars recognize it as a key success factor for third party logistics (Murphy and Poist, 2000). Murphy and Poist (2000) recognize the need for providers to employ experienced professionals to manage supply chains. Some scholars refer to 'knowledge' as new knowledge or expertise (Chapman et al., 2003) as management expertise resources for LSPs creating its service innovation. Some scholars consider firms hiring or recruiting people who have new skills, knowledge and quality (Poist et al., 2001; Razzaque and Sirat, 2001) as management expertise resources.

Some scholars indicate that developing people with appropriate education and training (Drew and Smith, 1998) help logisticians to develop skills, for example, systems thinking, information sharing or collaborative team work as management expertise resources. Logistics literature indicates that training and education allow firms to have better trained employees and managers of the right attitudes to face new competitive environments (Skjoett-Larsen, 2000; Lowson, 2003). Other scholars indicate that top management commitment is important in deploying strategy in human resources (Chiu, 1995; Skjoett-Larsen, 2000). In addition Myer et al. (2004) consider human capital such as education level, experience and skills as management expertise resources.

Another logistics literature considers the 'quality of human resources', comprised of employee's ability to learn, to use technologies to solve problems, to share knowledge, and provide new ideas (Lin, 2007) as management expertise resources. Lin's (2007) study of 583 LSPs in China confirms that the above conceptualization and measurement of 'quality of human resources' were reliable. Meanwhile Huang et al. (2006), from operations literature, measure the 'human-IT resources' as innovation management with a technical view, strategic management with a technical view, understanding of knowledge assets and utilization of professional knowledge assets were reliable.

Management expertise resources (e.g. the need for sufficient skilled, knowledge and experienced employees at management and non-management levels) are crucial to determine the LSP performance (Ellinger et al., 2008). They allow LSPs to utilize and execute firm technology and physical resources (Larson and Kulchitsky, 1999). Lin (2008) found that quality of human resource is significant to technology adoption in 142 LSPs in Taiwan. The results have confirmed previous arguments (Lai et al., 2005) that the lack of expertise in IT and employee knowledge are potential barriers for LSPs in adopting and implementing IT. In addition, Mentzer et al. (2004) proposed that management skills, knowledge, and logistics expertise are intangible resources which lead to logistics capabilities.

Management expertise resources have not received much attention from logistics literature as strategic resources and capabilities which lead to LSP competitive advantage. Therefore the conceptualization and measurement scales for management expertise resources have not been established for LSPs. Some logistics scholars refer to firm recruitment, training and education, skills, experience and knowledge as management expertise resources (e.g. Poist et al., 2001; Myers et al., 2004). The study of Lin (2007; 2008) and Ellinger et al. (2008) are recent studies that argue the importance of management expertise resources for LSPs.

2.3.3.4 Relational resources

The logistics literature often regards close relationships with trading partners, cooperation, collaboration, information sharing and trust, relationship orientation and relationship networks as relational resources. The logistics literature recognizes the importance of cooperative relationships between LSPs and suppliers and customers (Chiu, 1995; Larson and Kulchitsky, 1999; Gunasekaran and Ngai, 2003; Chapman et al., 2003; Panayides and So, 2005a). Such cooperative relationships have been conceptualized as ‘relationship networks’ and ‘relationship orientation’. From the RBV perspective, such cooperative relationships are called relational resources.

Some scholars regard close relationships with trading partners e.g. vendors and customers (Chiu, 1995; Daugherty and Pittman, 1995; Aldin et al., 2004), close coordination (La Londe and Master, 1994) or building more cooperative relationships (Larson and Kulchitsky, 1999) to be relational resources. It often reflects the business philosophy which requires business partners to jointly plan, execute and co-ordinate, to network and to provide greater understanding.

Chapman et al. (2003) define ‘relationship network’ as collaboration and coordination between providers and buyers. Meanwhile Panayides and So (2005a) conceptualize ‘relationship orientation’ into five dimensions: bonding (e.g. a long term relationship, working in close co-operation and keeping in touch constantly), empathy, frequent communication, shared value and trust. Panayides and So’s (2005a) study of 251 third-party LSPs in Hong Kong confirm that the conceptualization and measurement of ‘relationship orientation’ are reliable.

Sinkovics and Roath (2004) construct collaboration of manufacturers and 3PL relationships into working together to share proprietary information, develop new or synergistic ways to do business together. Larson and Kulchitsky (1999) consider relational resources to be made up of ‘partnerships’ which involve cooperation, collaboration, information sharing and trust. According to House and Stank (2001) logistics partnership involves formal and informal communication strategy which refers to ‘build a bridge between organizations’. Further Stank (2003) conceptualizes ‘relational performance’ which comprised of knowing customer needs well, cooperating with customers to help do the job well and continuous improvement on an ongoing basis as relational resources.

Murphy and Poist (2000) suggest that firms should be collaborative between parties to anticipate customer needs and deliver solutions to problems. This allows providers and users to have effective and ongoing communication (Murphy and Poist, 2000). Chapman et al. (2003) emphasize that the focus on customer needs requires a firm to gain a comprehensive understanding of the buyer’s entire value chain through developing relational networks. Kahn and Mentzer (1998) consider collaboration as shared ideas, information, mutual understanding and working together as a team. These relational resources, conceptualization and measurement, are reliable (Kahn and Mentzer, 1998).

The need for such relational resources is highly relevant and very important characteristics for logistics companies. In logistics, relational resources allow LSPs to coordinate business activities with trading partners such as suppliers, manufacturers, distribution centres, customers and logistics service providers (Skjoett-Larsen, 2000; Sander and Premus, 2005; La Londe and Master, 1994). Furthermore, collaboration invites better understanding of business partners and greater commitment to information sharing across a full range of various parties in the logistics network (Chen and Paulraj, 2004; Sander and Premus, 2005). Furthermore, collaboration and interaction significantly lead to firm performance (Kahn and Mentzer, 1998; Stank, 2003; Sanders and Premus, 2005).

Even though relational resources are essential for LSPs, there is no universal conceptualization and measurement scale for relational resources. Some logistics literature refers to 'relationship orientation' (Panayides and So, 2005a) and 'relationship networks' (Chapman et al., 2003) as relational resources for LSPs. Others refer to close relationships (Chiu, 1995) and partnerships (Larson and Kulchitsky, 1999) with trading partners such as suppliers and customers as relational resources.

Therefore relational resources should be conceptualized as an LSP's ability to build close relationships with customers and suppliers through collaboration and communication to coordinate, share relevant information and understand customer needs. These enable LSPs to improve firm performance and lead to firm competitive advantage.

2.3.3.5 Organizational resources

The logistics literature often regards strategic planning and business process as organizational resources which are more on corporate strategy and image; and need top management commitment to resources acquisition and continuously improve. Although organizational resources have not, as yet, been established in logistics literature some scholars report it as important intangible resources to understand LSP performance. Gunasekaran and Ngai (2003) consider strategic or capacity planning, Brah and Lim (2006) and Ellinger et al. (2008) consider 'operation strategy', Lowson (2003) considers 'reputation' and Yang et al. (2009) consider 'corporate image resource' as organizational resources which may have a positive impact on strategy and the objectives of an LSP.

Some logistics scholars refer to a firm's top management commitment and involvement and 'continuous improvement' (Chiu, 1995) as organizational resources. These organizational resources are regarded as 'total organizational involvement' (Murphy and Poist, 2000), 'organizational encouragement' (Lin, 2007; 2008) and 'managerial involvement' (Lai et al., 2008). Logistics literature considers the emphasis to be on commitment and involvement by LSPs as organizational resources and capabilities (Lin, 2008; Lai et al., 2008. The study of Lai et al. (2008) on 105 3PLs in China confirms that 'managerial involvement' as the degree of the manager of IT and others involved in IT strategic planning to be reliable. Meanwhile Lin's (2008) study of 142 LSPs in Taiwan confirms that 'organizational encouragement' such as company support and encouragement for employees to learn new information, problems and be innovative is reliable.

Meanwhile Bharadwaj (2000) from information system literature and Huang et al., (2006) from operations literature refer to 'IT-enable intangible' which emphasizes customer orientation as organizational resources and capabilities. They conceptualize 'IT-enabled intangibles' as emphasized on customer orientation, better coordination and increase responsiveness (Bharadwaj, 2000; Huang et al., 2006) as organizational resources. Furthermore, the Yang et al. (2009), study of 123 Taiwanese shipping containers confirm that the conceptualization and measurement of 'corporate image resources' comprising corporate reputation, financial stability and low cargo damage or loss record' were reliable.

Organizational resources are important for LSPs to understand their performance, to organize and improve organization and effectiveness and to achieve LSP strategies and objectives. Gunasekaran and Ngai (2003) identify that 'strategic and capacity planning' allow small 3PL in Hong Kong achieve firm performance. Organizational resources are required to synthesize strategy and objectives of LSP's into practices or routines. Brah and Lim (2006) consider 'TQM practices' (e.g. top management leadership, strategic planning, customer focus, quality focus, information system and analysis and human resources) as organizational resources that lead to firm performance.

The conceptualization of organizational resources has not been established and therefore it is supposed to be measured and constructed as LSP competence in its business process to organize its organization and improve its effectiveness in providing logistics services capability. Through developing systems, policy/procedures, and routines/practices to emphasize customer orientation LSPs are able to develop and achieve strategies and objectives into routines and practices which may enhance their competitive advantage.

2.3.3.6 Logistics performance

The constructs and measurements of LSP performance is another important focus for RBL study. In an attempt to measure logistics performance, this study reviews the logistics literature, both the performance of logistics users (e.g. manufacturers and retailers) and providers (LSPs). Previous scholars suggest different constructs for measuring logistics performance and yet it remains unclear which key performance indicators (KPIs) should be used for the logistics performance measurement (Wilding and Juriado 2004). Table 2.4 indicates that logistics performance is generally measured in terms of cost efficiency, delivery and quality, customer service, flexibility and innovation.

Table 2.4: Summary of logistics performance

Logistics performance	Users of LSPs	LSPs
Cost	Daugherty and Pittman (1995) Myer et al., (1996) Fawcett & Coper (1998) Stank et al., (2003) Wilding and Juriado (2004)	Sanders and Premus (2005) Brah and Lim (2006) Chen (2008) Lai et al. (2008)
Customer service	Daugherty and Pittman (1995) Fawcett & Coper (1998) Larson and Kulchitsky (1999)	Brah and Lim (2006) Chen (2008) Lai et al. (2008)
Quality	Daugherty and Pittman (1995) Myer et al., (1996) Stainer (1997)	Sanders and Premus (2005) Brah and Lim (2006) Chen (2008)
Delivery	Daugherty and Pittman (1995) Myer et al., (1996) Stainer (1997) Stank et al., (2003) Wilding and Juriado (2004)	Sanders and Premus (2005) Brah and Lim (2006) Chen (2008)

Flexibility	Myer et al., (1996) Larson and Kulchitsky (1999) Wilding and Juriado (2004)	Brah and Lim (2006)
Innovation	Myer et al., (1996) Stainer (1997)	Sanders and Premus (2005) Lai et al. (2008)

The logistics literature recognizes that the logistics performance scales have adopted different approaches for conceptualization and measurement for logistics performance (e.g. Myers et al., 1996; Daugherty and Pittman, 1995; Larson and Kulchitsky, 1999; Sanders and Premus, 2005; Brah and Lim, 2006; Panayides, 2007a; Ellinger et al., 2008). The measurement of logistics performance from the users of LSPs such as cost, customer service, delivery, quality, productivity and strategy has been widely accepted (Daugherty and Pittman 1995). Later, Myers et al. (1996) suggest innovation, cost and customer service (flexibility, delivery and quality) as logistics performance for users of LSPs. Furthermore, Fawcett and Cooper (1998) measure logistics performance in terms of cost, service, productivity, asset management, and customer and employee satisfaction; Larson and Kulchitsky (1999) suggest relations, customer service, efficiency and flexibility as logistics performance measures for users of LSPs.

Similarly Sanders and Premus (2005) consider cost, quality, delivery and new product introduction time as the logistics performance for LSPs. According to Lai (2004) and Panayides and So (2005a), LSP performance depends on the extent to which they add value (innovation) to their clients. Later, Chen (2008) proposes a model of LSP performance based upon vendor, LSP, manufacturer and customer points of view including cost of logistics, delivery, quality and service. Furthermore, Brah and Lim (2006) divide logistics performance for LSPs into three: operational performance, quality performance and technology performance. The internal operation performance of an LSP is evaluated in terms of cost, customer service, delivery, quality, flexibility and products/services process quality.

Another, different, view of LSP logistics performance is suggested by Panayides (2007a), which views performance in terms of improvement in market share, profitability, sales growth, return on investment and overall LSP performance .

The performance measurement system based on non-financial indicators is becoming an increasing interest to both practitioners and academics. Especially for the service industry, output is intangible and difficult to quantify. According to Wouters and Sportel (2005), performance measurement systems need to be clearly linked to the operational strategy of the organization. For this reason, Wilding and Juriado (2004) identify that delivery timeliness is the most common performance indicator followed by cost, overall quality, accuracy, responsiveness and flexibility and error rate. Meanwhile, the competitive battleground in logistics will focus on quality, productivity, speed and innovation (Stainer, 1997).

Logistics performance, as the dependent variables, are often measured in terms of three categories of firm competitive advantage: (1) customer service (delivery, quality and flexibility) (e.g. Myer et al., 1996; Stainer, 1997; Lai et al., 2008; Yang et al., 2009); (2) innovation (Myer et al., 1996; Stainer, 1997; Lai et al., 2008); and (3) cost (e.g. Daugherty and Pittman, 1995; Lai et al., 2008).

Customer services include the following:

- Delivery reliability - the speed of operation or the efficient use of time from order to delivery, which can be measured in terms of delivery timeliness, delivery accuracy, delivery performance and delivery quality (Stainer, 1997).
- Overall Quality – customer requirements and needs being consistently satisfied for a service (Stainer, 1997). It is measured in terms of service level, quality order, fleet quality (Wilding and Juriado, 2003); and damage free, order entry accuracy, packing/shipping accuracy, Bowersox et al. (2007).
- Flexibility – the ability of LSPs to respond to customer requests, to anticipate change, to adapt and to accommodate special or non-routine requests and to handle unexpected events, from both the view points of the supplier and the customer, ensuring minimal cost and delays (Myers et al., 1996; Stainer, 1997).

Previous study attempts to conceptualize and measure customer service performance have yielded reliable results. For example, Lai et al. (2008) measured ‘service quality advantage’ in terms of fast and reliable delivery, order accuracy, quick response to customer inquiries, prompt follow up of customer claims and complaints and smooth communication with customers. Yang et al. (2009) operationalized 'customer service performance' in terms of service quality, customer satisfaction and customer loyalty. These measurement scales for 'service quality advantage' and 'customer service performance' are reliable.

Service innovation performance is regarded as the aggressiveness in the reduction of order cycle time, the increasing value-added content of logistics services and its ability to provide new and better logistics services (Myers et al., 1996). Lai et al. (2008) operationalized 'service variety advantage' in terms of more service products and providing requested and customized services. The results of 'service variety advantage' are reliable.

Cost performance is regarded as operations costs such as total logistics cost, transportation cost, inventory and warehousing costs, manpower cost (Daugherty and Pittman, 1995). Lai et al. (2008) operationalized cost performance as 'cost advantage' which comprised of low service cost and charge is reliable.

Previous strategy literature argues that the RBV works examine the impact of firm-specific resources on the overall performance (Ray et al., 2004). However Ray et al. 2004) suggest that the firm performance is supposed to be measured by the business operation but not on the overall performance constructs (Ray 2004). The approach for measuring logistics performance should be multidimensional constructs which reflect in a composite measure of performance and its measurement should be collected from the data relating to the core objective of LSPs.

2.3.4 Performance impact of RBL

Recently, a few scholars have examined the impacts of 'relationship orientation' (Panayides, 2007b), 'organizational factors' (Lin, 2008), 'information technology capability' (Lai et al., 2008), and 'resources, logistics service capability and innovation capabilities' (Yang et al., 2009) on LSP performance. It is reported that these variables have positive significant impacts on LSP performance (Panayides, 2007a & b; Lin, 2008; Lai et al., 2008; Yang et al., 2009).

2.3.4.1 The performance impact of technology resources

Technology resources are regarded as technology-enabled logistics services and used to acquire, process and transmit information for effective decision making (Sanders and Premus, 2005). Hammant (1995) suggest that IT provides full and real time visibility of demand forecast information, inventory levels, production schedules and shipment status. According to Lai et al. (2005), IT enables LSPs to monitor the status of inventory, improve the utilization for transportation and warehouse assets, and further eliminate duplication of effort (data re-entry and errors). Sanders and Premus (2005) point out those technology resources allow for quick response and easy access to information, leading to lead time reduction, cost savings and customer satisfaction.

Previous logistics studies suggesting the important of IT in logistics argue that technology resources (IT) have emerged as a strategic resource in explaining logistics performance of LSPs (e.g. Chiu, 1995; Hammant, 1995; Alshawi, 2001; Aldin et al., 2004). The literature suggests that IT enables logistics operation to reduce costs (Chiu, 1995; Hammant (1995) and deliver competitive advantage in terms of customer service and productivity improvement (Hammant, 1995). Further, based on some case studies, Aldin et al. (2004) found that IT leads to significant progress e.g. goes beyond traditional cost savings and lead-time reduction, integrates process, changes structure, and increases value added.

Some scholars argue that the use of technology resources is valuable for LSPs (Lai, 2004; Lai et al., 2005). Lai (2004) conducted a survey of 232 LSPs in Hong Kong. The study concludes that a ‘full service provider’ seems to achieve a high level of technology-enabled logistics services. It is argued that such technology resources are essential to enable LSPs to solve problems and handle complaints more effectively. Lai et al. (2005) confirms, from a survey of 195 LSPs in Hong Kong that perceived IT adoption provides benefits for LSPs in terms of quick response and access to information, improves customer service, enhances competitiveness and reduces data entry, errors, paperwork and manpower. Based on interviews of five respondents, Lai et al. (2005) found that perceived IT barriers are due to lack of knowledge and expertise in IT (or, resource experts).

Some scholars argue that technology resources have an impact on performance (e.g Meyers, 1999; Lai et al., 2006). Myers et al. (1999) find that the availability of useful logistics information is significantly correlated with logistics performance. Furthermore, the Lai et al. (2006) survey of 105 3PLs in China find that there is a positive significant relationship between IT and logistics performance. The survey reports that superior IT has a significant impact on firm competitive advantage in terms of service advantage, service quality advantage and cost advantage (Lai et al., 2006). In summary, the literature finds that a higher level of IT application may lead to cost advantage and help to improve delivery speed and reliability, customer relations and order accuracy.

There are scholars who provide empirical results on the performance impact of technology resources. Sander and Premus's (2005) survey of 245 US firms reveals that IT capability to acquire, process and transmit information is positively related to firm performance (Sanders and Premus, 2005). Meanwhile Shang and Marlow's (2005) survey of 198 manufacturing firms reveals that information-based capability is positively related to logistics performance.

Furthermore, Lai et al.'s (2008) survey of 105 3PLs in China confirms that information technology capability has a positive relationship with firm competitive advantage such as cost, service and quality advantages. It is argued the improvement of IS and IT and its application leads to IT capability to support business operations and achieve competitive advantage; thus, LSPs are trying to acquire modern information systems and advanced information technologies (Lai et al., 2008).

Overall the logistics literature argues for the positive impact of technology resources on logistics performance (e.g. Lai et al., 2006; Lai et al., 2008). The study indicates that superior IT may result in improved competitive advantage in 3PL settings (Lai et al., 2006). Technology resources and capabilities benefit the overall competence of logistics capability and have been positively linked to performance (Bharadwaj 2000; Kearns and Lederer, 2003). IT remains the key enabler for achieving benefits such as lower cost and customer expectations. In addition Lai et al. (2008) find that information technology capability has a positive relationship with cost, service variety and service quality advantages. Most of these empirical studies focus on advanced technology and IT capability instead of advanced logistics equipment and continuous adaptation and improvement and maintenance in technology resources for logistics infrastructures.

2.3.4.2 The performance impact of physical resources

Physical resources are regarded as logistics and IT infrastructures which enhance logistics services capability to control logistics activities and facilitate movements of goods and information (Wouthers and Sportel, 2005). Such physical resources have the ability to provide logistics and distribution services (Facanha Horvath, 2005; Stefansson, 2006). Some scholars consider IT infrastructures as resources which enable integrated data-base and high speed network transmission capabilities, real-time update of inventory information and networking (Bharadwaj, 2000; Huang et al., 2006). Having these resources will lead to significantly higher levels of delivery efficiency (Stefansson, 2006).

It is important for LSPs to gain access to physical resources to maintain the control of logistics activities and to improve the reliability and speed of delivery (Karia and Razak, 2007; Wong and Karia, 2010). Physical resources could be one of the most critical (competitive) resources. Previous studies suggest that physical resources have resulted in considerable savings such as decreased inventories, decreased warehouse operation and transportation cost and improvement in delivery performance (Stefansson, 2006). In fact, physical resources such as vessels and cargo planes become costly to replicate due to the need for high capital investments (Wong and Karia 2010). Lai et al. (2006) argue that a low level of IT might be used to support administrative processes and but it may not directly contribute to service variety or service customization offerings. Furthermore Huang et al. (2006) and Yang et al. (20090 argue that physical resources and capabilities influence innovation and logistics service capabilities, leading to firm performance.

Despite many theoretical arguments supporting the positive impacts of physical resources on LSP performance, efforts to examine empirical evidence appear to have mixed results. A few scholars argue that IT infrastructures comprising computer and communication technologies may have a positive association with firm performance (Bharadwaj, 2000; Huang et al., 2006). Huang et al.’s (2006) survey of 155 firms in Taiwan reveals that IT infrastructure is not related to firm performance but it is positively related to customer orientation. In addition, Yang et al. (2009) find that container shipping service firms with a high degree of information equipment resources do not enhance firm performance but do influence innovation capabilities and logistics service capabilities. Logistics service capabilities are positively related to firm performance. Most of these empirical studies focus, primarily, on IT infrastructures instead of other physical resources such as plant, equipment, warehousing and transport vehicles.

2.3.4.3 The performance impact of management expertise resources

Management expertise resources are regarded as an LSP's ability to acquire and develop skilled people and integrate teams with technical, knowledge and experience. Such management expertise resources are crucial to utilize and execute firm technology and physical resources (Larson and Kulchitsky, 1999). There is lack of literature that examines the performance impact of management expertise resources.

Some scholars recognize the important of human resources in logistics (Novack et al., 1992; Drew and Smith, 1998; Zineldin, 2004, Wong and Karia, 2010). Other scholars focus on the extent of skill requirements for logisticians (Murphy and Poist, 1998; 2000; 2006; 2007; Mangan and Christopher, 2005). Two recent studies find that senior managers in the logistics business require proficiency in management skills, in addition to logistics skills and business skills (Murphy and Posit, 2006; 2007).

Previous studies argue that developing people will lead to sustainable performance; this is because learning will help logisticians to develop system thinking, information sharing and skill for collaborative teams to improve performance (Drew and Smith, 1998; Ellinger et al., 2002). Thus, there is an emerging realization that more investment is needed to develop appropriate skills and competencies for logistics managers; furthermore, Murphy and Poist (2006 & 2007) find that a firm's derived economics benefit from their investment in people.

Chapman et al. (2003) propose that new knowledge, quality and expertise of human resources may enhance service innovation in logistics companies. Lai et al. (2005) suggest that logistics companies need people with better skills and capabilities than their competitors. Larson and Kulchitsky (1999) argue that logistics people are supposed to be well-versed in technological tools such as EDI for the efficient use of technology and physical resources. Some argue that LSPs with a high level of management expertise resources will attain greater logistics performance in terms of cost, quality, responsiveness and customer satisfaction (Karia and Razak 2007; Wong and Karia 2009).

Management expertise resources are crucial for LSP performance (Lai et al., 2005) since logistics service is “knowledge” (Drew and Smith, 1998; Skjoett-Larsen, 2000; Lai et al., 2005) and a “people” oriented business (Novack et al., 1992, Zineldin, 2004). However, not many scholars have examined the performance impact of management expertise resources. Ellinger et al. (2002) find that learning behaviour comprised of developing learning skills and harnessing the knowledge of employees is related to customer service-related performance indicators such as response time for customer complaints, customer satisfaction, number of suggestions implemented and number of individuals learning skills. The survey conducted by Huang et al. (2006) based on 155 firms in Taiwan reveals that human resources such as technical skills and managerial skills are related to ‘IT-enable intangible’ which is comprised of customer orientation, better coordination and increased responsiveness. Further, the survey conducted by Lin (2008) on 142 LSPs in Taiwan indicates that organizational factors such as quality of human resources are significant for technology adoption in logistics companies. Most of these empirical studies have not conceptualized management expertise resources and further examined the impact of management expertise on LSP costs and customer service innovation.

2.3.4.4 The performance impact of relational resources

Relational resources are regarded as cooperative relationships through collaboration and communication and the attempt to understand and share relevant information. Relational resources allow LSPs to coordinate business activities (Skjoett-Larsen, 2000), and to interact and communicate (Panayides and So, 2005a; Panayides, 2007a) with customers and suppliers. For example, close relationships between customers, carriers and vendors allow LSPs to execute and co-ordinate networking and information sharing.

Some logistics literature regards relational resources as a firm competence in building relationships with customers and suppliers, which facilitates communication (Panayides and So, 2005a; Panayides, 2007a), coordination/collaboration (Skjoett-Larsen, 2000; Sander and Premus, 2005; La Londe and Master, 1994), and commitment in information sharing (Chen and Paulraj, 2004; Sander and Premus, 2005). In logistics, LSPs acquire relational resources to support cooperation and collaboration with trading partners such as suppliers, manufacturers, distribution centres, customers and logistics service providers (Skjoett-Larsen, 2000; Sander and Premus, 2005; La Londe and Master, 1994).

A logistics network requires high interaction and communication, be it formal or informal (Panayides and So, 2005a; Panayides, 2007a). Furthermore, collaboration promotes higher commitment on sharing information across a logistics network (Chen and Paulraj, 2004; Sander and Premus, 2005). This collaboration requires staffs with good communication skills that are able to negotiate and bargain with customers and suppliers to achieve customer satisfaction and cost reduction.

Relational resources have been argued as one of the key success factors for LSPs (e.g. Chiu, 1995; Gunasekaran and Ngai, 2003; Panayides and So, 2005a; Panayides, 2007a; Karia and Razak, 2007; Wong and Karia 2008). LSPs require relational resources to develop cooperative relationships between suppliers and customers. Relational resources are essential for LSPs to better understand customer needs and requirements (Knemeyer and Murphy, 2004; Panayides and So, 2005a; Panayides, 2007a). These relational resources also promote interactive participation and communication among business partners. Thus, these relational resources might reduce risk, the error of misunderstood customers and greatly improve efficiency of the overall logistical process (Bowersox et al., 2007).

When it comes to empirical evidence, ‘relational program’ is found to improve cooperation and performance (Larson & Kulchitsky, 1999). Another survey of user and provider relationships concluded that coordination or cooperation leads to improved performance (Forza, 1996). Moreover, a case study concludes that the closer relationship yielded lower costs and better delivery performance (Goffin et al., 1997). Stank (2003) conducted a survey on 111 firms and revealed that ‘relational performance’ (comprised of knowledge about customer needs, cooperation with customers and ongoing continuous improvement) is positively related to operational and cost performance and customer satisfaction. However, Sinkovics and Roath (2004) conducted a survey of 142 companies involved in outsourcing logistics (England, Scotland, Wales, North Ireland); the results indicate that 'collaboration' has no significant effect on logistics performance.

Despite many theoretical arguments supporting the performance impact of relational resources, only Panayides and So (2005a) examined the performance impact of relational resources for LSPs. Panayides and So (2005a) conducted a survey of 251 3PLs in Hong Kong. The study confirms that there is a positive relationship between 'relationship orientation' and firm financial performance and service quality. These imply that there is a need to understand the relational resources from the LSP perspective. Therefore relational resources need to be theoretically developed and tested on LSP performance in terms of cost and customer service innovation.

2.3.4.5 The performance impact of organizational resources

Organizational resources are regarded as an LSP's competence and approach to organize its organization to achieve the objectives of the LSP. They allow an LSP to conceive and implement its strategies to improve logistics performance. Previous logistics studies ascertain that organizational resources may be manifested in the form of 'reputation' (e.g. ability to provide required services or tailor to a customer's specific needs) (Sink, 1996; Aldin 2004), 'corporate image resource' (Yang et al., 2009), operation strategy (Lowson 2003) or strategic or capacity planning (Gunasekaran and Ngai, 2003); managerial practices (Brah and Lim 2006; Ellinger et al., 2008), IT-intangible resource (Bharadwaj, 2000; Huant et al., 2006) and management commitment and involvement (Lin, 2008; Lai et al., 2008) which enable firms to conceive and implement strategies to improve logistics performance.

The literature argues that organizational resources are used to understand an LSP's performance and to develop and achieve an LPS's strategies and objectives (Gunasekaran and Ngai, 2003; Lin, 2008; Lai et al., 2008), to synthesize the strategy and objective of LSPs into practices or routines (e.g. Brah and Lim, 2006; Lowson, 2003), and to reach customers and provide superior level of service (Bharadwaj, 2000; Huang et al., 2006). For instance, LSPs may wish to develop a strategy for customer orientation with the objective to understand customer needs and provide a superior level of service. This can be achieved by top management commitment and involvement to synthesize an LSP's strategy or objective into practices and routines including service improvement, which anticipates customer needs and provides solutions to their problems or provides unique or different services. These practices will lead to innovative service and cost efficiency.

There is little literature that empirically acknowledges organizational resources as a key success factor for LSPs (e.g. Murphy and Poist, 2000; Lai et al., 2008; Lin, 2008). The study of 51 providers and 68 users of logistics services reported that 'total organizational involvement' is a key success factor in 3PL relationships (Murphy and Poist, 2000). The SEM analysis on survey data of 105 3PLs in China shows that 'managerial involvement' is significantly related to IT capability (Lai et al., 2008). Meanwhile, Lin (2008) conducted a survey of 142 LSPs in Taiwan and reveals that 'organizational encouragement' is significantly related to innovation in logistics technologies (Lin, 2008). Yang et al.'s (2009) survey of 123 Taiwanese containers finds that 'corporate image resource' has a positive impact on innovation and logistics capability. Another study focusing on industrial firms finds that 'IT-enabled intangible' is positively associated with firm performance (e.g. return on assets and sales) (Huang et al., 2006). The study also finds that IT-infrastructure and human IT-resource are related to IT-enabled intangible.

The logistics literature suggests that organizational resources are another success factor for LSP performance. Brah and Lim (2006) find that TQM practices lead to greater responsiveness in delivery and greater customer satisfaction. Meanwhile, Ellinger et al. (2008) find that customer orientation encourages continuous improvement in logistics service quality which influences LSP performance. Most of these empirical studies have different conceptualizations and measurement scales for organizational resources and their empirical evidence seems not to explain the result in cost and customer service innovation. These imply that customer orientation, practices and management commitment and involvement in organizational effectiveness are important to add value in service and cost efficiency for LSPs and they should be theoretically developed and tested.

2.3.5 Underlying theories of studies in RBL

The lack of theoretical development and application in logistics research has been highlighted numerous times (Stock, 1990; 1997; Mentzer and Khan 1995; Olavarrieta and Ellinger, 1997; Skjoett-Larsen 1999). Perhaps, due to the lack of theoretical explanation, our understanding of logistics resources is still limited. Thus, there is a need for further theoretical development and more empirical evidence to enhance our understanding.

The logistics field is relatively young. Business logistics became a scientific discipline in the 1960s (Kovacs and Spens, 2005). However, the importance of logistics has only received significant recognition in the 1980s (Murphy Jr and Wood, 2004). Therefore, much of the logistics research has its roots in theories borrowed from the more established disciplines. In fact, logistics research is primarily an outgrowth from the business disciplines of marketing and management, with some input coming from engineering (Stock, 1997).

Meanwhile, Novack et al. (1992) identify a number of theories and concepts from economics (e.g. cost minimization, value added), marketing (e.g. channels of distribution, market transactions); finance/accounting (e.g. capital asset) and management (e.g. information flows, operations process, operations integration). These theories and concepts provide some input into the foundations of integrated logistics. Sachan and Datta (2005) argue that logistics research is influenced by economics in terms of the focus on cost minimization and profit maximization; and behavioural approaches in terms of the focus on psychology and sociology aspects. However, the resource-based view (RBV) theory is not prominent in the logistics literature. Many logistics scholars have suggested applying RBV theory in logistics research (Stock, 1997; Olavarrieta and Ellinger, 1997; Skjoett-Larsen, 1999).

2.3.5.1 Resource-based view (RBV) theory of firm growth

According to the strategy literature, the RBV theory is one of the fundamental principles for the competitive advantage of a firm. The RBV literature considers a firm as a collection of heterogeneous resources, or factors of production or as bundles of resources including all inputs that allow a firm to operate and implement its strategies (Penrose, 1959; Wernerfelt, 1984; Barney, 1991). The RBV of the firm posits that a firm's internal processes create a resource bundle which can become the means of creating and sustaining a competitive advantage (Bates and Flynn, 1995). However, very little empirical work on the relationship between firm resources and capabilities and performance has been conducted (Barney and Clark, 2007). Thus it is difficult to know, among all the resources and capabilities controlled by a firm, which of them might ultimately turn out to generate sustained competitive advantage (Barney and Clark, 2007).

Rooted in the strategic management literature, the RBV theory of the firm (Penrose, 1959; Wernerfelt, 1984) is applied in this research to develop the theoretical understanding of LSP resources and competitive performance. One of the main reasons for the choice of RBV theory is that it has been applied to determine the strategic resources available to a firm and attracted the attention of a growing number of scholars. Indeed, it is one of the most widely accepted theories in strategic management (Newbert, 2007). Armstrong and Shimizu (2007) identify 125 empirical RBV studies which appear in the strategic management literature “between” 1991 to 2005 (excluding other studies related to RBV, such as dynamic capabilities).

While the usefulness of RBV as a theoretical framework is still being debated (Barney 2001; Priem and Butler, 2001a & b; Hoopes et al., 2003), a numbers of empirical articles relating to the RBV have appeared, recently, in the logistics literature (e.g. Lai, 2004; Panayides, 2007b; Shang and Marlow, 2005; Ellinger et al., 2008).

Back to 1950, Edith Penrose (1959) is one of the first scholars to view a firm’s resources as an administrative organization and a collection of productive resources which determine firm performance. She attempts to understand the firm and its resources and suggests firm-specific resources employed explain a firm’s growth. Following Penrose’s work, Rubin (1973) views a firm as a collection or set of particular resources (activities) which enable the firm to perform particular tasks. Rubin (1973) argues that firms must process raw resources to make them useful. Due to the unpleasant properties of Rubin’s programming model on resources formulated to the direction of firm growth, the study does not invite immediate attention from academic and practical audiences (Wernerfelt, 1984).

Much like Penrose (1959) and Rubin (1973), Wernerfelt (1984) develops simple economic tools for analyzing a firm's resource position which leads to high profits. Wernerfelt (1984) argues that firm performance is driven directly by its products and indirectly by the resources which go into their production. He also proposes that firm critical resources may lead to high profits. However, the study does not gain immediate attention and it denies firm differences in building up valuable, rare, inimitable and non-substitutable resources as argued by Jay Barney's (1991) paper. Indeed, Wernerfelt (1995) himself acknowledges that his 1984 article is rather 'terse and abstract'.

Over the last 50 years, the resource-based view (RBV) has been highlighted as an important framework which theoretically explains firm growth but managers and researchers did not become aware of it till the 1990s (Newbert, 2007). The appreciation of RBV begins with Prahalad and Hamel's (1990) paper on 'The core competence of the corporation,' published in *Harvard Business Review*. Inconsistent with Penrose's and Rubin's works, Prahalad and Hamel (1990) focus on resource exploitation (static resources, inimitable skills, technologies, and knowledge) which are deployed by firms.

The second influential paper, Jay Barney's "Firm resources and sustained competitive advantage,' was published in the *Journal of Management* in 1991. Barney (1986; 1991) argues that firms compete on the basis of "unique" corporate resources that are valuable, rare, difficult to imitate, non-substitutable, and which generate sustainable competitive advantage (SCA). Furthermore in the short term, valuable and rare resources would attain a competitive advantage and firms enjoy improved performance but for a firm to sustain these advantages over time such resources must be inimitable and non-substitutable. Some resources, such as physical and technology, are easy to purchase or duplicate by competitors. It is often argued that physical IT resources are unlikely to serve as sources of competitive advantage (Ray et al., 2004). By developing and continuous adaptation in physical and technology resources or bundling these resources with other resources and capabilities a firm can survive competitive imitation and sustain competitive advantage.

According to Rumelt (1984), to survive competitive imitation (difficult to imitate), a firm's resources are supposed to be protected by isolating mechanisms such as time-compression diseconomies, historical uniqueness, embeddedness and causal ambiguity (Rumelt, 1984). These mechanisms are explained as follows:

- ***Time-compression diseconomies*** are regarded as the time needed to acquire the resource through learning, experience, firm-specific knowledge, or trained proficiency in a skill.
- ***Historical uniqueness*** refers to advantages that accrue due to unique resources such as distinctive locations, due to first mover advantages such as reputation, brand loyalty.
- ***Embedded*** resources are regarded as the value of resource being inexplicably linked to the presence of another complementary or co specialised resource.
- ***Causal ambiguity*** is regarded to be the ambiguity surrounding the connection between a firm's resource portfolio and its performance.

Recently the dynamic resource-based view of the firm has emerged as an extension to the RBV theory (Helfat, 2000; Helfat and Peteraf, 2003). Dynamic capabilities refer to resources and capabilities that continually adapt, integrate or reconfigure other resources and capabilities (Eisenhardt and Martin, 2000; Teece et al., 1997). According to Newbert (2007) researchers should move away from the "1991 – vintage" RBV approach which quantifies firm specific resources and capabilities toward the 'organizing approach', 'conceptual-level approach', and 'dynamic capabilities approach'.

The major strategic scholars who contribute to the development of RBV are listed in Table 2.6. The two assumptions for RBV theory are (1) resources and capabilities are heterogeneously distributed among firms; and (2) resources and capabilities are imperfectly mobile, which make firms' differences remain stable over time (Barney 1991). Every firm is different (heterogeneous) from other firms in terms of the resources and capabilities a firm possesses or accesses. These differences will differentiate one firm from another and a firm's success is due to its firm-specific (idiosyncratic) resources.

2.3.5.2 The use of RBV theory in logistics resources studies

Proponents of the RBV generally define resources very broadly. Individual resources, competencies and capabilities of the organization are a bundle of the firm's resources or the essence of the resource-based view (RBV). For instance, in logistics business, a resource is described as a basic element (Lowson, 2003) or a prerequisite for the development and operation of logistics; and it is required for building up a firm's capabilities (Aldin et al., 2004).

The logistics literature defines that logistics resources and capabilities vary extensively, making it difficult to generalize across studies (Chapman et al., 2003; Lai, 2004; Lai et al., 2008 and Yang et al., 2009) (detailed information refer Table 2.1 and 2.2). Resources can be categorized as internal organizational resources: input factors, firm-specific assets, capabilities or competencies, organizational processes, business attributes, information, knowledge and so forth (Novack, 1992; Closs and Thompson, 1992; Bharadwaj, 2000; Lowson, 2003; Mentzer et al., 2004; Yang et al., 2009).

The early definition of logistics resources and capabilities by Skjoett-Larsen (1999) describes that a resource is a complex interaction (intervene) of physical and human resources, including resources and capabilities, which provides logistics competence. Olavarrieta and Ellinger (1997) describe resources as specific capabilities which become strategic resources (distinctive capabilities), for example, the combination of physical resources and human collaboration and are repositories of a firm's knowledge – both tacit and explicit. These definitions are further expanded by Skjoett-Larsen (2000) to include access to information (IT), service improvement and human capital (top management commitment on investment in human resource). According to Lowson (2003):

> "Resource is a basic element that a firm controls to organize its operations. Competencies are the fundamental knowledge owned by a firm e.g. knowledge know-how, experience, innovation and unique information; and
>
> Capabilities reflect a firm's abilities to use its competencies and refer to the dynamic routines acquired by the firm or firm's managerial capacity to improve continuously the effectiveness of the organization" (Lowson, 2003).

Meanwhile, Mentzer et al. (2004) divide logistics resources into tangible resources (e.g. plant, equipment, raw materials, logistics networks, and distribution centres) and intangible resources (e.g. relationships, corporate culture, management skills, knowledge, logistics expertise, logistics services and customer loyalty). According to

Lai (2004) and Yang et al., (2009), tangible and intangible resources are the LSP's capability to create and deploy resources to enable logistics service capability. In general, Yang et al., (2009) classify resources into tangible (e.g. equipment and facilities, warehousing and EDI linkage, technology, information systems, hardware) and intangible (e.g. corporate reputation, organizational process relationship network and skills, know-how).

Specifically, Yang et al. (2009) classified LSP specific resources as corporate image, information equipment and network resources; and capability as service reliability, information integration/flexibility, value-added service and relationship building capability. In conclusion, these are LSP resources and capabilities which are ultimately the source of a firm's competitive advantage, improved performance and sustained competitive advantage (Lin, 2008; Lai et al., 2008; Yang et al., 2009).

Meanwhile, there are many classifications of the term resources from strategic literature as presented in Table 2.5 and yet little universal classification or definition. Grant (1991) distinguishes between resources and capabilities providing a classification of resources into tangible, intangible, and personnel-based resources as follows:

> "Tangible resources include the financial capital and physical assets such as plant, equipment, and stock of raw materials. Intangible resources include reputation, brand and product quality, while personnel-based resources include technical know-how and other knowledge assets including dimensions such as organizational culture, employee training and loyalty" (Grant, 1991).

Meanwhile, Amit and Schoemaker (1993) argue firms as bundles of resources and capabilities. They define resources as a stock of available factors owned or controlled by the firm; and capabilities such as the firm's capacity to deploy resources (tangible or intangible), in combination, using organizational processes to affect a desired expectation. For example, capabilities are tangible or intangible processes that are considered firm-specific and developed over time through complex interaction among the firm's resources.

> "<u>Capabilities</u> are information-based, tangible or intangible processes that are firm-specific and are developed over time through complex interactions among the firm's resources. Based upon developing, carrying, and exchanging information

through the firm's human capital; and often developed in functional areas (e.g., brand management in marketing) or by combining physical, human, and technological (Amit and Schoemaker 1993:35)".

Furthermore Day (1994) defines capabilities as complex bundles of skills and accumulated knowledge which are exercised through organizational processes which enable coordination of activities and make use of their assets.

Olavarrieta and Ellinger (1997), from logistics literature, define resources as related to having while capabilities are related to doing. This means resource serves as the basic unit of analysis while a firm creates competitive advantage by assembling resources that work together to create organizational capabilities. This requires co-operation and co-ordination of resources in order to be more productive (Grant 1991). A firm's resources are used as input and converted into services by using a wide range of other firm assets. On the other hand capabilities are regarded as a firm's ability to assemble, bundle and deploy valued resources, usually in combination or co-presence (Amit and Schoemaker 1993; Schulze, 1994).

Grounded in RBV, superior performance is dependent on the firm's resources and capabilities. Penrose (1959) views that the value of resources is to yield a service (enhance performance). Further firms are maximizing their resources value when they deploy capabilities to utilize valuable resources in their most suitable activities to yield superior performance. Hence, successful capabilities rely on a firm's resources such as human (managerial and technical staff), physical (equipment), technological and relational resources (Penrose, 1959; Grant, 1991; Hunt, 2001). Prahalad and Hamel (1990) argue that when resources are combined they can lead to the form of competencies and capabilities.

In particular, capabilities are regarded as special resources embedded in the organization and its processes. For example, capabilities are deeply embedded within complex-bundles of accumulated people knowledge and skills that come from training and long term experience; and exercised through organizational resource; the formal procedures and established "routines" (Nelson and Winter, 1982; Day, 1994; Winter, 1995). Furthermore, this embeddedness (ownership of capability) cannot be transferred

(Makadok, 2001). Thus capabilities are considered enablers to other resources or more than catalysts (Oladunjoye and Onyeaso, 2007).

Such capabilities are developed over time through complex interactions of many different resources; and based on developing, carrying and exchanging information through the firm's human capital or by combining physical and technology resource (Amit and Shoemaker, 1993). The distinction between resource acquired and capability building has to do with their timing.

> "No matter how great a firm's capabilities might be, they do not generate economic profit if the firm fails to acquire resources whose productivity would be enhanced by its capabilities (Makadok, 2001:389)."

Recently, there has been an increased application of the resource-based view (RBV) theory for understanding LSPs (e.g. Lai 2004; Panayides, 2004; Ellinger et al., 2008; Lai et al., 2008; Yang et al., 2009). For instance, there are discussions of LSP performance in terms of service capability which are derived from specific resources and capabilities of LSPs (Lai 2004; Yang et al., 2009), innovation capability (Yang et al., 2009), market orientation (Ellinger et al., 2008), the strategic development for LSPs (Hertz and Alfredsson, 2003), and the relationship between distinctive logistics capability (information technology capability) and sustainable competitive advantage (Lappin, 1996).

The RBV has been used in the strategic literature for the analysis of business performance. It is important to highlight that the RBV has recently been employed in logistics management studies to examine the logistics resources and capabilities on LSP logistics performance (Lai et al., 2008; Yang et al., 2009). Lai et al. (2008) from logistics literature, argue that the RBV theory is an appropriate theory for supply chain and logistics management research. These studies find logistics resources and capabilities to be significantly positive related to firm performance. Some literature uses RBV theory to examine the impact of IT on 3PL providers' competitive advantage (Lai et al., 2008) while others examine the effects of logistics capabilities on firm performance (Yang et al., 2009). Therefore the RBV will provide a theoretical foundation for this research to examine the relationship between logistics resources and capabilities and logistics performance.

Few logistics scholars apply RBV theory to relate firm competitive advantage, for example, how the firm combines its resources in ways that are different from its competitors (Olavarrieta and Ellinger, 1997; Persson and Virum 2001). Olavarrieta and Ellinger (1997) suggest the use of the bundling theory to explain the bundling of firm resources and the extent of differences among firms which allow firms to sustain competitive advantage. The bundling effects of resources and capabilities into the model is a concept rooted in strategy literature which views firms as a collection of tangible and intangible resources and capabilities (Penrose, 1959; Grant, 1991). Similarly the logistics literature suggests that LSP resources and capabilities which are tangible and intangible resources (Mentzer and Kahn, 2004; Lai, 2004; Yang et al., 2009) may have an impact on firm competitive advantage. Some logistics scholars consider technology, knowledge and relationship networks (Chapman et al., 2003); organizational and human resource factors (Lin, 2007) and corporate image and information equipment resources (Yang et al., 2009) as resource bundles which may impact logistics performance.

In conclusion the logistics literature recognizes the benefits of using RBV theory to understand the LPS performance impact of resources and capabilities. Recently, few scholars apply RBV to understand the impact of resources and capabilities on LSPs' competitive advantage and performance (Lai et al., 2008; Yang et al., 2009). These studies employ a resource heterogeneity approach of RBV theory which argues that a given resource or capability is valuable, rare, inimitable and non-substitutable and further tests the relationship between the extent of resources and capabilities and firm competitive advantage (Newbert, 2007). The research found that logistics studies are yet to employ and test the bundling effects of resources and capabilities on logistics performance. Furthermore, the research also finds that the organizing, conceptual-level and dynamic capabilities approach of RBV theory (Newbert, 2007) are not yet being employed by logistics literature.

2.4 Summary

The logistics literature recognizes that the emergence of logistics outsourcing and global supply chain has presented LSPs with challenges and demands for smarter ways to leverage productive resources and capabilities. In the competitive logistics industry it is essential for LSPs to gain access to and transform the right logistics resources into superior logistics performance and to sustain competitive advantage. The logistics resources studies have been concentrated on IT capability, relationship and logistics outsourcing. It has been predominately looked at from the user perspective but the LSP perspective has received little attention. Recently the number of scholars focusing on logistics providers has increased. Previous logistics studies have suggested that logistics resources such as technology, relationships, transport vehicles, and people are the determinants of logistics performance and firm competitive advantage. However the logistics literature has not considered the potential of total logistics resources. Also, some of the constructs and measurement scales for such logistics resources have not been established and empirically tested. Other problems are that the empirical study of the performance impacts of LSP resource-based logistics (RBL) is scarce and recent; and the theoretical development and application in logistics resources studies is very little. It is only recently that the logistics literature has started to discover the benefits of using the RBV to understand and explain the performance impact of logistic resources.

Table 2.5: Summary of resource-based view development and researcher contribution

Author	Aspect	Work
Penrose (1959) "Theory of firm growth" RQ: What is a firm? It is a collection of productive resources *conceptualization	Firm-specific resources Physical - plant and equipment Human - managerial and technical staff, Knowledge Employee capabilities Expertise of team management	Penrose (1959) identified potential importance of firm-specific resources were human (managerial and technical staff), physical (plant and equipment) resources and later included the knowledge and expertise of the team management. There are several real phenomena underlying this assumption: (1) using an existing machine to create additional units of this machine (this will apply primarily to firms such as machine tool producers); (2) training existing managers in new skills; (3) supervising the changes in routine necessitated by introducing new elements (e.g., machines) into the production process; and (4) using existing managers to train new managers.
Rubin (1973) RQ: What is resource? *Formulating about the assumption of resources to the direction of firm growth	Fixed input: People Real asset Used for production output or for training other resources Refer to Penrose.	The firm is viewed as a collection or set of particular resources (activities) which enable to perform particular tasks. Little formal attention due to modelling purposes (programming model). The value of a resource typically exceeds the market value of the individual parts due to the cohesiveness of the human part of the resource developed through mutual experience within the firm.
Hofer and Schendel (1978)	The first argued a direct relationship between competency and competitive advantage	Advantage is achieved through the unique position a company attains, relative to its competition by deployment of its competencies.
Caves (1980)	Firm resource Tangible Intangible	A firm's resources at a given time could be defined as those tangible and intangible assets which are tied semi-permanently to the firm.
Lippman and Rumelt (1982)	Ambiguity in resource	Used causal ambiguity to describe phenomenon surrounding business actions and outcomes that makes it difficult for competitors to emulate strategies.
Wernerfelt (1984) Proposition: Indentify types of resources lead to high profit Based on Penrose (1959) and Rubin (1973)	Resources: strength or weakness Brand names In-house knowledge of technology Employment of skilled personnel Trade contracts Machinery Efficient procedures Capital	1. A resource could be taught as a strength and weakness of a given firm. 2. Firm should be analyzed from the resource side at the level of the firm not just from the product side at the level of the industry. 3. Look at resources which combine well which firms already have. Suggested two counteracting effects are at work. On the one hand technology lead will allow the firm higher returns, and thus enable it to keep better people in a more stimulating setting so that the organization can develop and calibrate more advanced ideas than followers.

		The followers, on the other hand, find the reinvention of your ideas is easier that you found. So you need to keep growing technology capability in order to protect your position.
Barney (1986 & 1991)	Re source Valuable Rare Inimitable Non-substitute	RBV theory is a framework for the relationship between resources and sustainable competitive advantage (CPA). Short term – resources enhance performance. Long term – resources sustain in competitive advantage.
Prahalad and Hamel (1990)	Core competence Static resources and the firm's Inimitable skills Technology Knowledge	Paper for practitioners: resources deployed. Focus on resource exploitation when others ignored at the time. Bundling – when resources are combined they can lead to the form of competencies and capabilities.
Reed and DeFillipi (1990) Competency Competitive advantage Causal ambiguity	Ambiguity in resource and skills Causal ambiguity in competency-based advantage ➢ Tacitness ➢ Complexity ➢ Specificity	To investigate the relationship between causal ambiguity competencies and barriers to imitate; and thus to develop theory that underpins the concept of competitive advantage sustainability. Competency: defined as being the particular skills and resources a firm possesses and superior way in which they are used. Higher degree of tacitness, complexity, and specificity will produce high degree of ambiguity.
Grant (1991)	Resource Tangible Intangible Personnel-based Capabilities	- Financial capital, physical assets: plant/equipment - Reputation, brand quality - Technical know-how, knowledge asset: organizational culture, employee training - Firm's ability to assemble, integrate and deploy valued resource, in combination.
Amit and Shoemaker (1993) View firm as bundle of resources and capabilities	Resources – available factors owned or controlled by firm Capabilities – firm's capacity to deploy resources (tangible or intangible) to effect desired end	Resources, capabilities and strategic – concepts in RBV theory Capabilities - based on developing, carrying, and exchanging information through the firm's human capital. Capabilities - often developed in functional areas (e.g., brand management in marketing) or by combining physical, human, and technological

Day (1994)	Capabilities: ➢ complex bundles of skills and accumulated knowledge ➢ exercised through organizational process which enable to coordinate activities and make use of their assets	
Teece et al. (1997)	Resources with dynamic capabilities	Firms' differences (resource with dynamic capabilities) lead to competitive advantage.
Hunt (2001)	Tangible and Intangible Financial Physical Human Organizational Informational Relational	Firm's resources can be defined as tangible and intangible entities available to the firm that enable it to produce efficiently and effectively. - Cash resources, access to financial market - Plant equipments, legal trademark, licenses - Skill and knowledge individual employees - Competences, control, policies, culture - Knowledge from customer and competitive intelligence - Relationships with suppliers and customers.
Hafeez et al. (2002)	Resource as anything tangible or intangible owned or acquired by a firm Capability as the ability to make use of resources to perform some task or activity	
Newbert (2007)	Category of RBV approach Resource heterogeneity approach (HA) Organizing approach (OA) Conceptual-level approach (CA) Dynamic capabilities approach (DA)	HA – quantify the amount of a given resource and capability possessed by a firm – valuable, rare, inimitable and substitutable (Barney, 1991) . OA – identify the interaction of an effective exploitation of the resources and capabilities. CA – identify the attributes of resources and capabilities based on Barney (1991). DA – identify the interaction of a specific resources and a specific dynamic capability.

CHAPTER 3: THEORITICAL FRAMEWORK

3.1 Introduction

This chapter covers RBL theory development, conceptualization of RBL and logistics performance and hypotheses development. This chapter first focuses on the conceptualization of the constructs of resource-based logistics (RBL) and then examines the extent to which it impacts logistics performance. Specifically, it defines the constructs of RBL and establishes measurement items for each construct. Subsequently, it focuses on the developing hypotheses by justifying the direct and bundling effects of RBL and logistics performance.

Novel features of this research are the constructs and measures of RBL, and the theoretical foundations for explaining relationships between RBL and logistics performance. This approach helps to gain a better understanding of what, which, how and why each RBL and bundles of RBL enhances LSP performance.

3.2 Resource-based Logistics (RBL) Theory Development

Recognizing the lack of theoretical development and application in logistics research, several logistics scholars have called for a shift to a more theory-driven research (Stock, 1997; Mentzer and Kahn, 1995). Earlier studies of the impacts of logistics resources on LSP performance did not use any specific theory (e.g. Lai et al., 2006; Panayides, 2006; Brah and Lim, 2006). To search for a theory which explains the performance implications or competitive advantage of logistics resources, this research refers to the resource-based theory of the firm from the strategy literature (Penrose, 1959; Wernerfelt, 1984; Rumelt, 1984; Barney, 1991).

The use of RBV theory to examine tangible and intangible logistics resources and capabilities to understand logistics performance has previously been recommended in the logistics literature (Olavarrieta and Ellinger, 1997; Skjoett-Larsen, 1999; Mentzer et al., 2004). Already there are some recent studies which apply the RBV theory to understand the impacts of logistics resources on LSP performance (e.g. Lai et al., 2008; Yang et al., 2009; Wong and Karia, 2010), mainly due to the relevancy of RBV theory to LSPs.

The resource-based theory views the firm as a bundle of resources and capabilities from which a firm can gain superior performance and competitive advantage by developing and deploying unique and idiosyncratic resources and capabilities (Barney, 1991). According to Barney and Clark (2007) firm resource and capability attributes will generate superior performance. The attributes of the resources and capabilities enable firms to create and implement its strategies. According to Barney (1991), idiosyncratic resources and capabilities e.g. valuable, rare, inimitable and non-substitutable are determinants of a firm performance. Since an LSP is different (heterogeneous) from other LSPs in terms of resources and capabilities they acquire, no two LSPs will possess the same capability, or access to the same assets, or build the same organizational routines. These differences will differentiate the performance of one LSP from another. The resource-based theory suggests that superior performance is dependent on the manner in which (1) firms leverage their resources and capabilities; (2) firms bundle their resource and capabilities (3) firms acquire and develop their resources and capabilities (RC).

In strategic management and logistics literature, there are many different opinions about the conceptualization of resources. From the strategy literature terms such as "resource", "competence", and "capability" have been applied; some scholars do not differentiate them but some say that they are different from one another (Barney and Clark, 2007). Another theoretical foundation drawn from the strategy literature is the conceptualization of tangible resources, intangible resources and capabilities which will arguably have an impact on firm performance (Lippman and Rumelt, 1982; Itami, 1987; Dierickx and Cool, 1989; Barney, 1991). For this research, the term "resources" is generally referred to as tangible and physical resources and the term "capabilities" is generally referred to as intangible resources. Tangible or physical resources such as facilities, equipment and technologies are required to deliver value-added service to customers (Amit and Schoemaker, 1993). Intangible or non-physical resources such as expertise (Penrose, 1959), relationships with suppliers (Hunt, 2001) and organizational routines (Grant, 1991) are capabilities which add economic value to a firm by reducing a firm's cost and differentiating its service.

The RBV literature also views resources as the act of acquiring something which is used as inputs for organizational process to enhance performance. On the other hand, firm capabilities are related to 'doing' things or making resources more visible or useful, for example, ability to combine, develop and deploy its resources to create value. Resources and capabilities are dependent on each other; resources are sometimes seen as a source of a firm's capabilities (Grant, 1991; Amit Schoemaker, 1993). The resource-based view theory also suggests that it is the attribute (or characteristic) of a firm's resources and capabilities that makes it more difficult to imitate. The RBV literature further argues that resources and capabilities which are rare and valuable will provide temporary competitive advantage but only resources and capabilities which are costly to imitate and substitute will become the sources of sustainable competitive advantage (Barney, 1991; Barney and Clark, 2007).

The problem is that very little empirical work on the relationship between firm resources and capabilities and performance have been conducted (Barney and Clark, 2007). Thus it is difficult to know, among all the resources and capabilities controlled by a firm, which of them might ultimately turn out to generate sustained competitive advantage (Barney and Clark, 2007). The need to empirically examine the performance impact of tangible and intangible resources and capabilities has been recommended in the strategy literature (e.g. Ray et al., 2004). The strategy literature argues that in reality, intangible and tangible resources will often be bundled together to enable the execution of a particular business process. The tangible resources and capabilities such as computer hardware and software may be bundled with intangible resources and capabilities such as the organization's commitment to customer service to enable the execution of customer service (Ray et al., 2004). The resource-based logic also explains that the former resources are often important to enable a firm to execute a business process but the latter resources are likely to be a source of sustained competitive advantage (Ray et al., 2004). Similarly the logistics literature suggests that it is difficult for other players to imitate if both tangible and intangible resources are combined well (Skjoett-Larsen, 1999; Yang et al., 2009). However, this suggestion is rather hypothetical because there is currently very little study on the logistics performance impact of logistics resources and capabilities.

Following the previous strategy literature (Penrose, 1959; Wernerfelt, 1984) which views a firm as bundles of resources, it is likely that RBL controlled by an LSP, if combined well with existing resources, would allow the LSP to perform well on its logistics operations. Similarly in the logistics literature, logistics resources and capabilities have been suggested (Olavarrieta and Ellinger, 1997; and Skjoett-Larsen, 1999) and proven valuable to LSPs from both customer service and productivity perspectives (Lai et al., 2008; Yang et al., 2009). Thus, an LSP acquires a collection of resource-based logistics (RBL) as the foundation for its activity, strategy and profitability.

According to previous strategy literature, resources and capabilities cannot be productive by themselves until they are bundled together (Grant, 1991; Amit and Schoemaker, 1993). LSP resources and capabilities need co-operation and co-ordination among them in order to be productive to complement each other. This means that an LSP's RBL are path-dependent with other resources or capabilities.

In logistics practice, it is often hard to distinguish resources from capabilities. In fact, resources and capabilities do intervene with each other (Skjoett-Larsen, 1999). According to previous strategy literature (Makadok, 2001), a firm's capabilities can only generate economic value when the firm has successfully acquired its necessary resources. Therefore, LSP capability is built up from the productive value of resources that are possessed by the LSP. This means that an LSP's existing resources are likely to promote capabilities, leading to bundles of resources and capabilities.

The strategy literature (Barney, 1991) argues that in the short term, firm performance is determined by its valuable and rare resources to attain a competitive advantage and improve performance and, to take these advantages over time, those resources must be inimitable and non substitutable. Some scholars argue that firms may achieve sustainable competitive advantage when they manage to create resources and capabilities bundles in a particular manner (Barney, 1991; Amit Schoemaker, 1993; Bates and Flynn, 1995; Teece et al., 1997). Similarly the logistics literature argues that LSPs creating certain bundles of logistics resources and capabilities may improve performance and sustain competitive advantage (SCA) (Olavarrieta and Ellinger, 1997; Yang et al., 2009)

RBV literature argues that in order to sustain competitive advantage over time or to survive competitive imitation (difficult to imitate), resources and capabilities should be protected by “isolating” mechanisms such as uniqueness, embeddedness and causal ambiguity (Rumelt 1984). Thus, this research suggests that while an LSP can easily acquire or duplicate physical resources or technology resources (e.g. warehousing and EDI), LSPs shall compete against other providers by assembling resources and capabilities which create organizational capabilities (innovation) in order to survive competitive imitation (Teece et al., 1997). Although LSP RBL are valuable, rare and inimitable, they are most likely to lead to a sustainable competitive advantage only when resources are bundled with others (Amit and Schoemaker, 1993; Teece et al., 1997). In summary, based on the RBV theory, this research suggests:

- Differences in terms or resources and capabilities among LSPs allow some LSPs to achieve SCA
- LSP performance is dependent on how LSPs bundle their RBL in ways which is different from competitors
- A different performance outcome is expected when RBL is bundled differently
- Valuable and rare RBL is a source of competitive advantage and performance improvement
- Inimitable and non-substitutable RBL is a source of SCA

This suggests that RBL on its own may have a direct impact on logistics performance but a different or greater outcome is anticipated when RBL is bundled with different levels and types of RBL. This research suggests that valuable and rare RBL lead to logistics performance but inimitable and non-substitutable RBL lead to greater logistics performance.

In addition to the RBV theory, this research believes that the human capital theory and organizational (structure) capital theory are suitable for explaining LSP performance. In fact, they are entrenched in the resource-based view of the firm which has a specific focus on tangible and intangible composition of human capital and organizational capital.

3.2.1 Human capital theory

As one HR executive of global logistics provider puts it, “Finding talent in Asia these days is a nightmare. We are paying top-salaries for mediocre talent” (Putlitz and Teissier, 2007).

Human capital theory is a means of production, into which additional investment yields additional output. Grant (1991) refers to intangible human capital as the intangible aspect of human resource which includes skills, knowledge and abilities. Barney (1991) regards the conceptualization of human capital as training, experience, judgment, intelligence, relationships, and insight of individual managers and workers in a firm. Meanwhile from the macro-economic point of view, the tangible and intangible composition of human capital can be considered as the 'physical means of production' (Becker, 1964). In addition to machinery and equipment, there is a need to invest in human capital via education, training and medical treatment. Human capital is substitutable, but not transferable like land, labour, or fixed capital (Becker, 1964).

The value of intangible human capital has been acknowledged in human relation theory since the 1920s and 1930s by Elton Mayo (1933), who argued that managers should develop social skills to facilitate interpersonal communication across formal and informal groups in an organization. The theory suggests that human factors play a significant role in raising productivity; productivity is achieved through the continuous improvement of practical knowledge held by workers. The theory argues that the experience and judgment of workers is a source of new knowledge (Mayo, 1933). Another attribute of intangible human capital is the ability of managers to work together; technical know-how (Penrose, 1959).

Furthermore, from information system literature intangible human capital such as experience and knowledge accumulated within a firm can be considered as management expertise (Rueber, 1997). Rueber is the pioneer who conceptualizes management expertise as a human capital which consists of specific skills (context-specific), multiple experience (experience which leads to the acquisition of multiple expertise), concrete experience (instead of the duration of experience), and continuous acquisition and development skills. Penrose's (1959) theory of firm growth argues that firm knowledge and experience gives rise to "excess" resources which can be deployed to explore and exploit productive opportunities, ultimately leading to the achievement of firm goals. It is the knowledge and competence of human assets that really matter (Prahalad and Hamel, 1990).

When exploiting employees' knowledge emphasize is to achieve core competencies that are valuable, rare, inimitable and non-transferable (Barney, 1991; Hamel and Prahad, 1990). According to Teece et al. (1997), competitive advantage based on human resource is much more difficult to imitate than the competitive advantage derived from physical and financial resource. For example firm gains management expertise resources by training its employees in the relevant technical IT and managerial skills or hiring new employees that already have the relevant skills to build and use IT applications to provide services (Barney and Clark, 2007). Management expertise resources are used to carry out job responsibility and ultimately to achieve firm performance (Grant, 1996).

The logistics literature has acknowledged management expertise resources are a crucial enabler for LSPs to execute firm resources and capabilities which may directly affect cost, quality, responsiveness and customer satisfaction (Karia and Razak, 2007; Panayides, 2007b). Further, an intensity of human interaction is required for the efficient use of technology and advanced physical resources, the effective bundling and coordination with logistics parties such as suppliers, manufacturers and retailers and the execution and implementation of organizational strategy and objective. Thus, the development of these management expertise resources is developed over long periods of time and is causally ambiguous and socially complex. Therefore, management expertise resources are valuable and heterogeneously distributed across firms and will be a source of sustained competitive advantage.

A number of logistics scholars have acknowledged the importance of human resource for LSPs (Novack et al., 1992; Drew and Smith, 1998; Zineldin, 2004, Wong and Karia, 2010). The emerging realization is that more investment is needed to develop appropriate managerial skill and competencies for logistics managers. Developing people leads to sustainable competitive advantage because learning will help logisticians develop systems thinking, information sharing and skills for collaborative teamwork to improve performance (Drew and Smith, 1998, Ellinger et al., 2002).

The logistics literature suggests that firms derive economic benefits from their investment in people (Murphy and Poist, 1994; 1998; 2006; 2007). For example, in logistics business the senior manager requires proficiency in management skills followed by logistics skills and business skills (Murphy and Poist, 1994; 1998; 2006; 2007) such as social skills, decision skills, problem-solving skills and time management skills (Myers et al., 2004). Another issue is the importance of good communications skills, interpersonal skills, quantitative and technology skills.

In this research, specific skills (context-specific), multiple experience (experience which leads to the acquisition of multiple expertise), concrete experience (instead of the duration of experience), and continuous acquisition and development skills are reflected as management expertise resources. These management expertise resources have been recognized since they directly affect cost, quality, responsiveness and customer satisfaction (Karia and Razak, 2007; Panayides, 2007b). Global logistics management requires LSPs to emphasise this intangible human capital such as acquisition and development of employees who possess better skills and capabilities than their competitors. Such skills and knowledge leveraged in human capital leads to employees who efficiently and effectively deliver services and improve cost of LSPs.

The need for sufficiently skilled, knowledgeable and experienced employees at management and non-management levels is essential for the survival of an LSP. In this stiff competition among players, LSPs often acquire new skills, knowledge and qualities in logistics people (Poist et al., 2001; Razzaque and Sirat, 2001). They must be well-versed in technological tools such as EDI for the efficient use of technology and physical resources (Larson and Kulchitsky, 1999). Lai et al. (2005) suggests that the lack of expertise in IT and inadequate knowledge of employees are the potential barriers for LSPs in adopting and implementing IT.

Human capital theory originates from economics while management and organization theorists are more interested in organizational capital. Human capital theory is often used at a macro-economic (e.g. national) level. Previous literature which advocates organization capital theory critiqued the idea of human capital. Human capital theory focuses on the investment and education of staff to generate expertise and experience but organizational capital focuses on managerial practices e.g. structure, process, system, procedure, culture, etc.

3.2.2 Organizational capital theory

The meaning of organizational capital is multi-faceted. The study of organizational capital has been discussed in the field of strategic management. Organizational capital theory, in strategy literature, considers quality control systems, corporate culture and relationships are essential components of organizational capital (Hofer and Schendel, 1978). Tomer (1987) suggests that organizational capital consists of a firm's formal reporting structure, its formal and informal planning, controlling, and coordinating systems, as well as informal relations among groups within a firm and between a firm and those in its environment.

In this research, from the resource-based view, organizational capital is considered an essential organizational resource for LSPs. These often reflect as organizational practices to emphasise on continual improvement. Teece and Pisano (1994) refer to 'organizational competencies' as an organization's ability to respond rapidly to changes in the environment. Hunt and Morgan (1995) define organizational resources as the assets a firm possesses that arise from the organization itself, the corporate culture and climate, the organization's structure, valued brand name and the administration history of the firm. Hunt (2001) views competence, policy, control and culture as organizational resources but considers relationship with suppliers and customers (relational resource) as relational capital or network.

In addition, Edelman et al. (2005) conceptualize organizational resources as a firm's structure, systems, policies, culture, procedures, routines and resources. They measure organizational resources in terms of procedures, routines and resources which develop customer service capability, up-to-date equipment and computer technologies, unique products/services, employees with international experience and strategic alliance linkages.

In summary, there is no agreement on what organizational capital or resources are. Researchers advocating organizational theory have as many different and competing definitions for organizational capital or resources; in addition to the above compositions of organizational capital, 'organizational culture' must be considered (Barney and Clark, 2007). Barney (1991) argues that organizational culture enables a firm to do things and behave in ways that lead to high revenues, low cost or high economic value (valuable).

Such resources must have attributes and characteristics that are not common to the cultures of a large number of firms (rare); and must be imperfectly imitable to provide sustainable competitive advantage.

Certain organizational cultures enable firms to do things better for employees, customers, suppliers and others. Peters and Waterman (1982) and Porter (1980) note that a firm with a strong culture to staying close to its customers can create significant positive economic value. Organizational resources are basically the intangible elements of an organization. Tomer (1987) defines organizational capital resource as an intangible factor which contributes to the productivity of a firm. Similarly Barney (1991) argues that the organizational capital resources are socially complex. Such organizational resource enables a firm to conceive and implement strategies to improve its performance (Barney, 1991).

Organizational theory can be applied to understand organizational resources which contribute to LSP performance. For instance the management systems and routines are essential in reaching customers and providing superior levels of services (Edelman et al., 2005). Firms with better organized systems and approaches appear more capable of implementing innovative strategies (Edelman et al., 2005). Surveys of 192 small businesses reveal that there is a positive relationship between organizational resources and the firm strategy of quality/customer service and innovation (Edelman et al., 2005).

Furthermore, Amit and Schoemaker (1993) argue that organizational resources can be used to affect other firm-specific resources such as physical, human and technological resources. Such firm-specific resources can be combined, developed and enhanced over time through organizational process. The complex-bundle of knowledge and skill developed through training and experience are actually executed through organizational resources (Day, 1994). Thus organizational resources may be theorized as an enabler to other resources (Oladunjoye and Onyeaso, 2007) to enhance superior performance.

From the logistics literature, organizational resource attributes are arguably essential for the continuous creation of customer value to satisfy end-users, which are often reflected in management practices (Brah and Lim, 2006; Karia and Razak, 2007; Ellinger et al., 2008). For example, total quality management practices allow an LSP to control and improve service quality, leading to greater delivery responsiveness and customer satisfaction (Brah and Lim, 2006; Karia and Razak; 2007). Meanwhile, Ellinger et al. (2008) considered LSPs with a strong market orientation (which encourage continuous improvement in logistics service quality) to outperform the market expectations. Such practices are organizational resources which, in turn, may influence LSP performance.

3.3 Conceptualization of RBL and Logistics Performance

3.3.1 RBL definitions and conceptualization

In this research, resource-based logistics (RBL) is defined as resources and capabilities which are acquired, provided and developed by an LSP. These resources and capabilities are considered as logistics distinctive capability (Olavarrieta and Ellinger, 1997; Lowson, 2003) - a key strategic resource which is valuable, scarce and both difficult and costly to imitate. Specifically, logistics capability can be viewed as the ability of LSPs to create or deploy logistics resources (Lai, 2004). The logistics literature, grounded on resource-based theory, describes specific resources and capabilities as strategic resources (distinctive capabilities). For example, the combination of physical resources and human collaboration is considered the repositories of a firm's knowledge – both tacit and explicit (Olavarrieta and Ellinger, 1997).

To move logistics literature forward, this study develops a theoretical model for RBL. The researcher first identifies logistics resources and capabilities acquired by LSPs. The definition of RBL in this research is inspired by Wong and Karia (2010). Based on RBV theory this study initially established five groups of logistics resources following the five groups of logistics resources identified by Wong and Karia (2010) e.g. physical, human, information, knowledge and relational resources. While Wong and Karia (2010) intended to study resources acquired by LSPs, their dataset provided mainly information about resources owned by 15 LSPs. Instead, this study views such resources from a capability, instead of an ownership perspective – this study conceptualise each logistics resources and capabilities as the ability of LSP to acquire or gain access to each of the five resources and capabilities.

This study follows the argument that a firm's resource is anything tangible and intangible owned or acquired by a firm while a firm's capability is its ability to make use of resources to perform some task or activity (Hafeez et al., 2002). Further interviews with Malaysia logistics managers and a pilot survey helped this study to refine the five resources into two tangible resources - physical resource and IT resource, and three intangible resources and capabilities - management expertise, relational resource and organizational resource. This study includes both tangible resources and intangible capabilities because the interviews revealed that they are both important to LSPs. This study called these logistics resources as resource-based logistics (RBL) since they are grounded in the RBV theory. They may be considered as logistics distinctive (idiosyncratic) capability (Olavarrieta and Ellinger, 1997) - a key strategic resource which is valuable, scarce and both difficult and costly to imitate.

Hence this research considers technology, physical, management expertise, relational and organizational resources and capabilities as parts of RBL. These five components of RBL are the independent variables for this research. This research considers technology resources and physical resources as tangible resources. Technology resources include advanced equipment and facilities as well as advanced technology or IT and IS. Physical resources include logistics and IT infrastructures. Meanwhile management expertise resources, relational resources and organizational resources are considered intangible resources and capabilities.

To indentify the potential measurement items for five RBL variables, this research examines both strategy and logistics literature. The potential measurement items are later confirmed by interviews with Malaysian LSPs and used to develop the survey questionnaire for this research.

3.3.2 Technology resources

In this research, technology resources are regarded as an LSP's ability to acquire advanced equipment and facilities as well as advanced technologies including web-based systems, logistics systems and technology (e.g. IT and IS) for the improvement of logistics equipment and activities. This research includes advanced equipment and facilities, improvement in logistics facilities and technology usage, web-based information systems and new or technology advanced equipment as measurement items for technology resources.

Technology resources are essential for LSPs to control their logistics activities and support their business process. The new or technology advanced equipment such as automated storage and warehousing are the most critical part for technology resources. Web-based information systems often depend on computer platforms, communication technology and software systems. Such technology resources enable innovation capability which LSPs use to enhance their control over logistics activity through enhanced communication, transmission, processing of information and delivery. An effective information system (IS) is another important part of technology resources for data processing efficiency and data maintenance accuracy (Daugherty et al., 1999). In addition, investment in technology resources will ensure an LSP has advanced equipment and improvement in logistics facility and technology. These technology resources will increase the LSP's ability to execute improvement and technology usage to keep up with and up-date advanced IT and IS or other sophisticated technologies (Wu et al., 2006). Such technology resources are used to acquire process and transmit information for more effective decision making (Sander and Premus, 2005). Technology resources enable information to be accessed and used by various parties in the logistics network.

Some LSPs compete with advanced technology. Such LSPs, called 'technology-enabled logistics', use and develop technologies for tracking and tracing shipment information, providing web-based linkages, and receiving/sending shipment notices (Lai, 2004). Logistics technologies or IT applications (Lai et al., 2006) such as RFID, EDI, GPD and GIS (Huang et al., 2006; Panayides, 2006) are regarded as innovation in logistics. Thus, Panayides (2006) refers to technology resources and capabilities as 'firm innovativeness' and encourages LSPs to invest in new systems and adopting new processes. Other technology resources for LSPs have been highlighted by the logistics literature; for example modern information systems (IS) and advanced information technology (IT) (Lai et al., 2008), advanced equipment and facilities, for example, automated material handling equipment, automated storage, tracking systems, heavy use of management technologies and more sophisticated logistics systems (Brah and Lim, 2006), and ‘information equipment resources’ which comprise of EDI facilities, internet service facilities, and cargo tracking system facilities (Yang et al., 2009).

Previous logistics literature argues that advanced technology resources or IT attributes enable LSPs to monitor the status of inventory, to improve the execution of transportation and warehouse assets and to eliminate duplication of effort (data re-entry and errors) (Lai et al., 2005). They allow easy access to information and, therefore, a quick response to customer needs (Sanders and Premus, 2005; Lai et al., 2005). They enable information to be accessed and used by various parties in a logistics network so that everyone can increase their effectiveness and efficiency (Skjoett-Larsen, 2000; Brah and Lim 2006). Previous logistics literature also argues that most LPSs adopt logistics information systems to integrate all required information which enables management to monitor inventory at all locations throughout the organization with multiple warehouses in multiple countries (Hammant, 1995; Lai et al., 2005).

The strategy literature regards technologies such as computer-telephony integration, use of scanning to store and retrieve policies, web-enabled customer interaction as technology resources (Ray et al., 2004). The literature suggests that technology resources and investments in the customer service process tend to be more tangible (Ray et al., 2004). Technology resources are the process-specific ITs that are used to support specific processes (Ray et al., 2004). Accordingly, the strategy literature has also been suggested that IT is a possible source of sustained competitive advantage (Barney and Clark, 2007). Barney and Clark (2007) found that most research in strategic IT has focused on the ability of IT to add economic value to a firm by either reducing a firm’s costs or differentiating its products or services.

3.3.3 Physical resources

In this research, physical resources are regarded as an LSP’s ability to acquire logistics and IT infrastructures as well as ongoing maintenance and improvement in equipment and facilities. This research includes logistics facilities and equipment, facilities and equipment improvement and maintenance, IT infrastructure such as basic communication tools, IT facilities (e.g. bar-code and EDI facilities), hardware and software assets as measurement items for physical resources to support logistics operations and administration processes.

Physical resources availability is the fundamental requirement of LSPs. Logistics facilities and equipment are essential to support the entire logistics operations to produce and provide service and place. Equipment and facilities such as warehouses, transportation and packaging equipments (Closs and Thompson, 1992; Stefansson, 2006) or physical tools and machines for assembling, repackaging and warehousing with EDI linkage are important for effective delivery (Lai, 2004). Moreover, investment in physical resources may require improvement and maintenance for logistics and IT infrastructure. The necessary IT infrastructure is another important requirement of physical resources availability to facilitate the communication between customers and supplier. These physical resources are essential for LSPs to provide logistics service capability which leads to enhanced logistics performance.

Some LSPs provide IT infrastructures encompassing ‘logistic ICT’ which includes hardware, software and IT networks (Chapman et al., 2003) or physical IT assets such as computer and communication technologies, technical platforms and databases (Bharadwaj, 2000) as physical resources. These physical resources are essential for LSPs to communicate and interact with customers and suppliers. Others refer to these physical resources as ‘physical IT assets’ such as communication tools, hardware and software (Chapman et al., 2003). Such facilities and equipment for logistics are usually required to support logistics operations and activities.

The strategy literature argues that physical resources and capabilities take the form of machines, tools or robots such as specialized equipment and physical tools (Barney and Clark, 2007). Physical resources also are regarded as plant, facilities and equipment considered as input for a firm to grow (Penrose, 1959; Wernerfelt, 1984; Barney, 1991). These physical resources are particularly important to support the entire firm’s operations to produce and provide service and place (Penrose, 1959). In addition these physical resources are used to speed up production and cost advantage (Barney and Clark, 2007).

The logistics literature suggests that those physical resources and capabilities are used to facilitate the delivery operations e.g. movement of materials, work in process and finished goods (Closs and Thompson, 1992; Bowersox et al., 2007; Karia and Razak, 2007). In addition IT facilities such as EDI and internet service facilities are used to facilitate the movement of information to support logistics operations or business (Aldin et al., 2004).

3.3.4 Management expertise resources

In this research, management expertise resources are regarded as an LSP's ability to acquire, recruit, and develop skilled people and integrated teams with technical ability, knowledge and experience. This research includes the LSP's commitment to recruit experienced workers from the same industry, multi-experienced workers, skilled and educated workers and training for managerial and logistics skills as measurement items for management expertise resources.

Management expertise resources are required to accomplish the LSP's objectives and achieve performance. Given the era of information and knowledge, the LSP's management commitment on human resources (Skjoett-Larsen 1999) is essential for management expertise resources development. Experienced and professional workers are significant for LSPs to accomplish outstanding service and customer satisfaction. If the right people are assigned to support logistics operations with appropriate allocation, these people are able to transform their knowledge and skills into a better performance. Proper training provided to employees will also increase their knowledge and skills in order to perform better. These attributes of management expertise resource are individuals who are capable of demonstrating the skills necessary to fulfil organizational tasks effectively.

The LSP's specific skills, knowledge, experience and abilities are difficult to transfer to another firm, even if an employee from one firm transfers to another which can be used as a competitive weapon. Management expertise resources require LSP to acquire managerial IT skills and knowledge. Such management expertise resources involve the interaction of IT, logistics and business knowledge possessed by logisticians. These lead to significant information processing when employees interact with customers, when customers make inquiries, request changes to policy or conduct EDI transactions. Thus the development of managerial IT, logistics skills and knowledge take years to develop and are a socially complex process.

The information system literature considers that developing or bringing in new people with expertise, skill and experience, and hiring workers with skills and knowledge from the same industry or with multiple experience workers (Rueber, 1997) as management expertise resources. When firms hire and develop these management expertise resources, the intangible elements of human capital are manifested within employees and accumulated within a firm (Mayo 1930; Penrose, 1959; Becker, 1964). Such management expertise resources are used to carry job responsibilities, accomplish tasks and, ultimately, achieve a firm's objectives (Barney, 1991; Prahalad and Hamel, 1990; Teece et al., 1997). Such management expertise resources often provide economic value to the firm and are the source of competitive advantage (Lado and Wilson, 1994). Thus firms can compete with knowledge and employee capabilities (Pennrose, 1959; Rueber, 1997).

Previous logistics literature suggests that management expertise resources require LSP's management commitment in human resources (Skjoett-Larsen, 1999). LSPs also provide training and education (Drew and Smith, 1998) for logistics people. Some LSPs recruit people with logistics, managerial and business skills (Posit et al., 2001; Razzaque and Sirat, 2001), others hire experienced professionals (Murphy and Poist, 2000), people with expertise, skill and experienced from the same industry, workers with logistics skill and knowledge (expert in particular job) (Chapman et al., 2003; Lin, 2007; 2008). These management expertise resources help to accomplish tasks and turn up the LSP's productivity by improving cost efficiency and service effectiveness.

Some LSPs compete with management expertise resources and capabilities. For example in the logistics business senior managers are required to be proficient in management, logistics skills and business skills (Murphy and Poist, 1991; 1994; 2006; 2007). Other studies emphasize that social skills, decision skills, problem-solving skills and time management skills, communications skills, interpersonal skills, quantitative and technology skills (Myers et al., 2004) are important for logisticians. These management expertise resources are essential for LSPs to operate logistics business in a global market.

The logistics literature also views management expertise resources and capabilities from the 'quality of human resources' perspective. Quality of human resources allows employees to learn, to use technologies, to solve problems, to share knowledge, to provide new ideas (Lin, 2007). Management expertise resources are also regarded as 'human-IT resources' such as innovation management with a technical view, strategic management with a technical view, understanding of knowledge assets and utilization of professional knowledge assets (Huang et al., 2006). These commitments on management expertise resources will increase the significant role of human resources in determining the competitive advantage of LSPs.

3.3.5 Relational resources

In this research relational resources are regarded as an LSP's ability to build close relationships with customers and suppliers through collaboration and communications to coordinate and share relevant information and understand customer needs. This research includes coordination and collaboration with customers and suppliers, communication, commitment to information sharing, and attempts to build mutual and long term relationships as measurement items for relational resources.

LSPs acquire relational resources to coordinate their logistics service and to ensure their delivery complies with customer requirements. This helps LSPs to coordinate their technology and physical resources to fit to their logistics capability which leads to a better service. This commitment leads to a sustainable competitive advantage for LSPs (Brewer and Speh 2000; Mentzer et al., 2000). Relational resources require communication to understand their external and internal customers accurately and successfully (Sanders and Premus, 2005; Lai et al., 2005). Such relational resources are essential for LSPs to have superb rapport with customers and suppliers (Myers et al., 2004) which lead to an effective agreement on management of contract. The information exchange and sharing between customers and suppliers help LSPs to eliminate unnecessary error and cost. Such relational resources promote LSPs to better understand customers, effectively participate and manage contracts, and to ensure winning a new contract, extension of contract or secure a long term contract (Wong and Karia, 2010).

Logistics literature suggests that the relationship between customers, carriers and vendors allow LSPs to execute and co-ordinate networking and information sharing, for example, requests for information (RFI). The development of the relational resources and capabilities allow LSPs to understand customer needs and requirements which involves significant interaction and information processes when logisticians interact with customers or suppliers, when customers make requests for information, changes for delivery, policy or cost charge. This relational resource and capabilities development also take some time to develop and are a socially complex process.

Previous logistics literature suggests that relational resources are essential for LSPs. The coordination and collaboration with trading partners such as suppliers, manufacturers, distribution centres, customers and logistics service providers (Skjoett-Larsen, 2000; Sander and Premus, 2005; La Londe and Master, 1994) are an important determinant for LSP performance. Relational resources require formal and informal interaction (House and Stank, 2001) and frequent communication (Panayides and So, 2005a). Such relational resource involves LSPs to require their staffs to have good communication skills to interact and negotiate with customers and suppliers effectively. Collaboration means every partner works together to share their proprietary information, and develop new or synergistic ways to do business together (Sinkovics and Roath, 2004). Relational resources require that every business partner works together as a team by sharing ideas and information (Kahn and Mentzer, 1998) with a commitment to information sharing (Chen and Paulraj, 2004; Sander and Premus, 2005) or having mutual understanding (Kahn and Mentzer, 1998) and long term relationships (La Londe and Master, 1994; Gunasekaran and Ngai, 2003).

Similarly the strategy literature suggests that relational resources and capabilities are fundamental to business performance (Rumelt, 1984; Wernerfelt, 1984; Hunt, 1997) which provides value to a firm (Hunt, 2001). Relationships with customers and suppliers allow firms to communicate, collaborate and coordinate customer needs and requirements which enable a firm to continuously provide the best service at the lowest cost (Porter, 1985; Hunt, 2001).

3.3.6 Organizational resources

In this research organizational resources are regarded as LSP competences in the organizational routines, practices and culture which focus on customer satisfaction and requirements. This research includes LSP practices and routines for providing solutions to customers and focusing on customers' requirements and satisfaction, culture (e.g.

continual improvement for sustainable service, total quality management and environmental policy for safety and health) and management commitment (e.g. trust, communication and interaction) as measurement items for organizational resources.

Organizational resources are important determinants for an LSP to organize its organization and improve its effectiveness. In order for LSPs to provide solutions for their customers, they require top management commitment and support to implement strategy and objectives. Routines and practices allow LSPs to execute and implement strategies and objectives by responding to customer needs and requirements and providing solutions to their problems. These management systems and routines are important to reach customers and deliver quality services. These processes involve participation and interaction with customers and suppliers when they make inquiries or request changes. Such organizational resources and capabilities are developed over long periods of time and often are path-dependent and socially complex processes.

The logistics literature suggests that managerial involvement in strategic planning (Lai et al., 2008) and customer orientation (Ellinger et al., 2008) are considered as organizational resources. Such commitment on customer requirements enables LSPs to provide any solution to customers and achieve customer satisfaction. Further, the LSP's objective to understand logistics performance requires organizational encouragement (Lin, 2008) to support total involvement and participation, commitment and trust with business partners. These organizational resources are significant for the competitive advantage of LSPs.

RBV theorists regard firm competences in the development of systems, routines, policies, business processes and ways of doing things, as organizational resources (Hofer and Schendel, 1978, Tomer, 1987; Grant, 1991). The strategy literature suggests that organizational culture with the state of staying close to customers (Porter, 1980; Peters and Waterman, 1982), with the objective to understand logistics performance (Tomer, 1987) and with a strategy to improve performance (Barney, 1991) are regarded as organizational resources. Such organizational resources and capabilities are intangible resources which are socially complex processes (Barney, 1991). Some organizational culture enables firms to do things for employees, customers, suppliers and others, some have attributes and characteristics that are not common to the cultures of a large number of firms (rare); and some are imperfectly imitable to provide sustained competitive advantage.

Furthermore, organizational resources are intangible resources which are socially complex resources and capabilities (Barney, 1991). Thus, organizational resource attributes enables a firm to conceive and implement strategies and objectives of LSPs to its service effectiveness and cost efficiency.

3.3.7 Logistics performance

The dependent variables of this research are logistics performances in terms of customer service, service innovation and cost leadership. This research argues that customer service in terms of delivery, quality and flexibility (delivery, quality and flexibility) (e.g. Myer et al., 1996; Stainer, 1997; Lai et al., 2008; Yang et al., 2009) and innovation (Myer et al., 1996; Stainer, 1997; Lai et al., 2008) are the main logistics performances leading to competitive advantages of LSPs. Of course, competitive advantage in terms of cost performance is equally important for LSPs (e.g. Daugherty and Pittman, 1995; Lai et al., 2008).

The first measure of logistics performance used in this research is the customer service which comprises of service delivery, service quality and service flexibility (Stainer, 1997) and service innovation (Lai et al., 2008). Delivery performance is referred to as the speed of operation (on time and accurate). Service quality is referred to as the satisfaction of the logistics service level. Service flexibility is referred to as the ability to provide variable responses to meet changing needs of customers. Meanwhile service innovation is regarded as the aggressiveness or ability in the reduction of order cycle time, increase of value-added content of logistics services and the ability to provide new and better logistics services (Myers et al., 1996) such as innovation of new service products and provisions of customized services (Lai et al., 2008). This research argues that the combination of customer service and service innovation together is a more appropriate performance which differentiates an LSP’s competitiveness as compared to other players.

The second measure of logistics performance used in this research is cost performance. Operations costs such as total logistics costs and transportation cost, inventory and warehousing costs, manpower costs (Daugherty and Pittman, 1995) are essential costs for an LSP. To encapsulate the competitive element of logistics services, this research consider an LSP's cost leadership as an important competitive advantage over other players.

As argued by the RBV theorists (Huselid et al., 1997; Ray et al., 2004), firm performance is supposed to be measured by multiple performance aspects of a business operation. The performance impact of resources and capabilities of customer service and cost leadership vary. Some resources and capabilities have customer service innovation advantages and others have cost advantage. Thus, this research has chosen to include customer service innovation and cost leadership as the two essential performance constructs for LSPs.

3.3.8 The theoretical framework

The theoretical framework for this research is presented in Figure 3.1

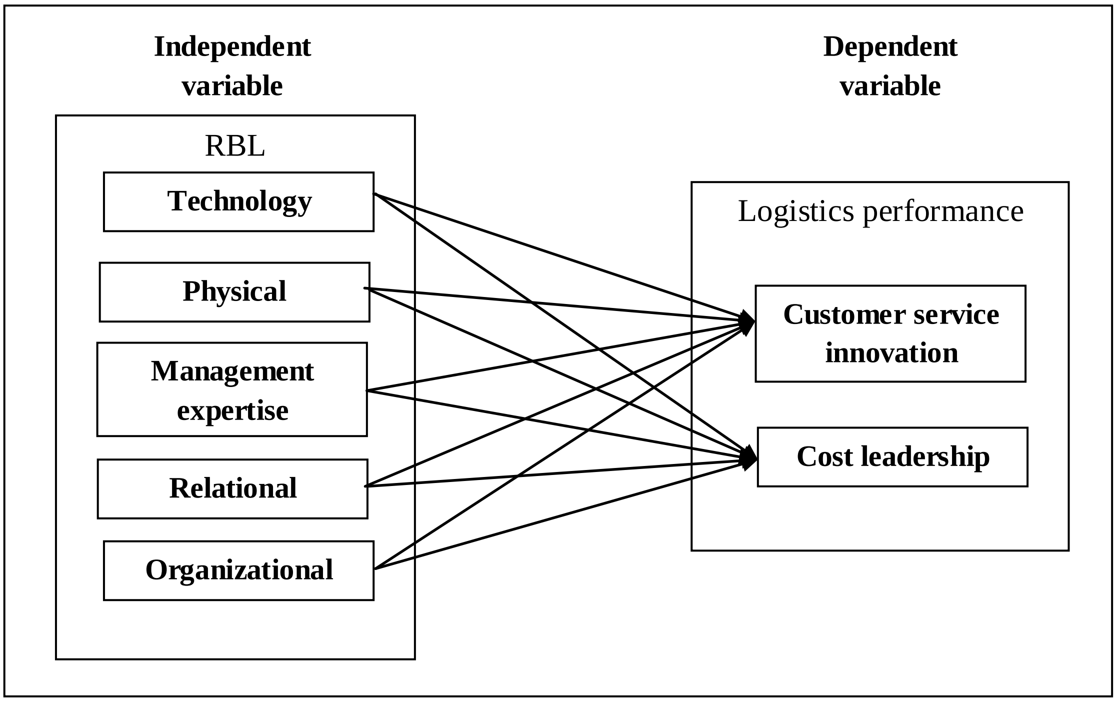


Figure 3.1: A theoretical framework

This research considers RBL as independent variables and logistics performance as a dependent variable. The figure shows the hypothesized relationships between the five RBL and the two logistics performance variables. In summary each of the tangible and intangible resources and capabilities of RBL may have an influence on each logistics performance.

3.4 Hypotheses Development

3.4.1 The direct effects

This research suggests that each RBL may translate logistics operations into logistics performance. In other words, this research argues that logistics performance is derived from RBL. This study assumes that the relationships between RBL and performance are positive and they will be tested (refer to Chapter 7). Another theoretical premise of this research is that a high (low) level of RBL components will produce a high (low) level of logistics performance. The following sections develop hypotheses for such direct effects.

3.4.1.1 Technology resources and performance

Technology resources are regarded as an LSP's abilities to acquire advanced equipment and facilities as well as advanced technologies including web-based systems, logistics systems and technology (e.g. IT and IS) for the improvement of logistics equipments. These technology resources and capabilities enable innovation for improving communication, transmission, processing of information and delivery. In the strategy literature, RBV theorists argue that technology resources such as IT are a major source of competitive advantage (Penrose, 1959; Wenerfelt, 1984; Barney, 1991). Barney and Clark (2007) find that most research in strategic IT has focused on the ability of IT to add economic value to a firm by either reducing a firm's costs or differentiating its products or services.

Similarly, previous logistics studies point out that technology resources and capabilities (information technology, IT) have emerged as strategic resources in explaining logistics performance of LSPs (e.g. Chiu, 1995; Hammant, 1995; Alshawi, 2001; Aldin et al., 2004; Lai et al., 2005). Logistics literature agrees that technology resources and capabilities such as tracking and tracing shipment information and web-based linkages allow LSPs to provide quick response to customers and easy access to information, leading to time reduction, cost savings and customer satisfaction (Sander and Premus, 2005; Brah and Lim, 2006). IT enables LSPs to monitor inventory status, utilize transportation and warehouse assets effectively and eliminate duplications of effort and errors (Lai et al., 2005). Furthermore, Yang et al. (2009) find that container shipping service firms with a high degree of 'information equipment resources' (e.g. EDI and cargo tracking facilities) are able to enhance their innovation and logistics service capabilities, which have a positive correlation with customer service performance.

IT enables LSPs to achieve lower costs and meet customer expectations. Technology resources are important resources used to support logistics operation, reduce costs, and improve customer service (Hammant, 1995; Chiu, 1995). Technology resources and capabilities enable information to be assessed and used by various parties in the logistics network. Sharing of real-time information and effective communication will help an LSP to capture customer needs and improve customer service. Panayides (2006) considers technology resources and capabilities as the ability to innovate in logistics; his study concluded that technology is positively related to logistics service quality. Meanwhile, Lai et al. (2006) find that 3PL firms with a higher level of IT application could offer faster and more reliable delivery, leading to improved customer service, service quality, and a higher level of service variety and customization. Advancement in IT and IS allows LSPs to offer unique, different services or better solutions to customers (Lai et al., 2008). Lai et al. (2008) find that IT capability has a positive relationship with service variety and service quality.

Furthermore, the use of advanced equipment and facilities such as GPS and GIS will minimize operations and distribution costs (Brah and Lim, 2006; Lin 2007). The improvement in information technology allows LSPs to reduce data re-entry and errors and subsequently leads to cost savings (Aldin et al., 2004). Lai et al. (2006) find, from a study of 105 3PL firms, that 3PL firms could achieve a cost advantage over their competitors when they move to a higher level of IT (e.g. IT integrated service product). The modern IT and IS used in the logistics industry to support decision making at all levels of the organization helps LSPs to keep track of customer orders and provide essential feedback to customers, leading to cost and service advantages (Lai et al., 2008). Furthermore, a positive relationship between IT capability and cost advantage is confirmed by a recent study of 3PL firms (Lai et al., 2008).

Applying the above theoretical underpinning, it can be deduced that technology resources will have a positive impact on LSPs' competitive performance.

Hence this research proposes hypothesis 1:

> Hypothesis H1: The higher the level of technology resources and capabilities the greater is the logistics performance in term of (a) customer service innovation and (b) cost leadership.

3.4.1.2 Physical resources and performance

Physical resources are regarded as an LSP's abilities to acquire logistics and IT infrastructures as well as the ongoing maintenance and improvement of physical equipment and facilities. Logistic infrastructures such as warehouses and transport vehicles are used for the effective delivery of logistics services while IT infrastructures such as computer hardware and software are used to support the logistics operation and activities. RBV theorists argue that physical resources and capabilities take the form of machine tools or robots such as specialized equipment and physical tools which can be used to speed up production and cost advantages (Barney and Clark, 2007). RBV theorists argue that physical assets can serve as the sources of competitive advantage only if they "out-performed" equivalent assets of competitors (Barney, 1991; Rumelt; 1984).

Logistics literature acknowledges that physical resources such as facilities and equipment resources (e.g. warehouses and vehicles) allow LSPs to provide a place and offer services for their customers (Closs and Thompson, 1992; Bowersox et al., 2007; Karia and Razak, 2007). Logistics and IT infrastructures as well as ongoing maintenances and improvement in equipments and facilities are important for LSPs to have compatibility with their business partners. These allow LSPs to offer consistent service and also provide value-added service for their customers. LSP adaptation and continuous investment in physical resource leads to higher levels of efficiency due to better equipment and resource utilization. In addition, the IT infrastructure such as basic communication tools, IT facilities (e.g. bar-code and EDI facilities), hardware and software allow LSPs to have internal and external communication with suppliers and customers before performing the right delivery at the right place and time.

Physical resources and capabilities are the most critical tangible resources to control logistics operations and activities as well as to perform the flexibility and reliability of service operations and delivery. Physical resources also need to be improved to fit to new logistics capability and to be better than competitors and subsequently possess the level of capability acquired by customers. These values of investment in physical resources are costly to imitate, requiring an investment of time and capital to succeed. Therefore the attributes of physical resources achieve core competencies which are valuable, rare, inimitable and non-transferable which enhance superior logistics performance.

The strategy literature suggests that physical resources and capabilities will add economic value to a firm and more likely be the source of SCA (Barney and Clark, 2007). The strategy literature argues that plant and equipment are particularly important to support the entire firm's operations to provide service and place (Penrose, 1959). These physical resources and capabilities are used by firms to provide and support customer services (Ray et al., 2004). Ray et al. (2004) suggest physical resources may improve customer service performance. Although physical resources and capabilities can be purchased or duplicated fairly easy, Deirickx and Cool (1989) argue that time compression diseconomies make it difficult for newcomers to catch up; simply "throwing money" and purchasing the IT facilities or physical IT assets may not lead to superior performance.

Similarly, previous logistics studies point out that physical resources and capabilities are valuable resources that improve logistics performance (Persson and Virum, 2001; Facanha and Horvath, 2005; Huang et al., 2006). Logistics literature acknowledges that physical resources allow LSPs to provide a place and offer services for their customers. These enable LSPs to enhance control over their logistics activities which lead to added value to the customer and cost savings. Furthermore, certain physical resources and capabilities such as warehousing with EDI enable LSPs to manage their materials and information flow which add more comprehensive logistics services to fully satisfy customer requirements. Persson and Virum (2001) and Facanha and Horvath (2005) point out that physical resources may lead to firm performance. However Huang et al. (2006) find that IT-infrastructure capability does not directly affect firm performance.

Logistics equipment and machines are used to facilitate the movement of material, work in process and finished goods (Closs and Thompson, 1992; Bowersox et al., 2007; Karia and Razak, 2007). IT facilities such as computer facilities and internet service facilities are used to facilitate the movement of information to support logistics operations and business (Aldin et al., 2004). These physical resources and capabilities obviously allow LSPs to support the logistics operations and administrative process and to improve customer service and faster delivery. Higher levels of physical resources and capabilities will lead to a higher the level of service variation and customer service innovation.

The logistics literature suggests that physical resources and capabilities may save costs and improve the reliability and speed of delivery (Karia and Razak, 2007; Wong and Karia, 2010). Physical resources and capabilities enable LSPs to support logistics operations and provide logistics service capabilities by improving their cost efficiency such as reducing operations costs for warehousing and inventory. Furthermore, physical resources and capabilities have resulted in considerable savings such as decrease in inventories, in warehouse operation and transportation costs, and the improvement of delivery performance (Stefansson, 2006).

Hence this research proposes hypothesis 2:

> Hypothesis H2: the higher the level of physical resources and capabilities the greater is the logistics performance in terms of (a) customer service innovation and (b) cost leadership.

3.4.1.3 Management expertise resources and performance

In this research, management expertise resources are regarded as an LSP's abilities to acquire, recruit, hire and develop skilled people and integrate teams with technical, ability, knowledge and experience (Penrose, 1959; Rueber, 1997). The ability to acquire such resources depends greatly on management commitment in human resources by bringing in people with expertise, skill and experience and recruiting workers with logistics skills and knowledge from the same industry or with experience workers (Rueber, 1997). Both RBV theory (Penrose, 1959) and human capital theory (Becker,

1964) argue that firm knowledge and employee capabilities provide economic value to the firm. Skills, knowledge, experience and abilities are used to carry out job responsibilities, accomplish tasks and ultimately achieve a firm's objectives (Barney, 1991; Prahalad and Hamel, 1990; Teece et al., 1997). In addition, Wright et al., (1995) find that firms exhibit higher performance when they recruit and acquire competent employees.

Similarly, the logistics literature also suggests that appropriate education and training help logisticians to develop and possess better skills and capabilities than their competitors leading to cost savings and quality service. In addition, it is argued that management commitment to human resources is important because better trained employees and change managers perform more effectively in a competitive environment (Chiu, 1995; Skjoett-Larsen, 2000; Lowson, 2003). The logistics literature also argues that management expertise resources and capabilities enable LSPs to utilize and execute their tangible and intangibles resources and capabilities, deliver innovative ideas for effective management of logistics operations and inspire trust and confidence, leading to superior logistics performance in terms of cost savings, service quality, service innovation, quick service (responsiveness) and customer satisfaction (Skjoett-Larsen, 2000; Karia and Razak, 2007).

Previous logistics literature agrees that management expertise resources and capabilities (e.g. new knowledge, quality and expertise of human resources attributes) may enhance service innovation in logistics companies (Chapman et al., 2003). Meanwhile Lai et al. (2005) suggest that LSPs need information technology expertise to develop or manage advanced technology. Research further shows that quality of human resources is significant to the adoption of technologies in a study of 142 LSPs in Taiwan (Lin, 2007). Such management expertise resources and capabilities enable LSPs to execute innovation in logistics technology resources and to provide better services to customers in a competitive market. These lead to an LSP's competitive advantage and to satisfying their customers' needs. Another argument is that management expertise resources and capabilities may improve an LSP's productivity through better efficiency and effectiveness in managing logistics activities, thus creating a cost advantage.

Hence this research proposes hypothesis 3:

Hypothesis H3: the higher the level of management expertise resources the greater is the logistics performance in terms of (a) customer service innovation and (b) cost leadership.

3.4.1.4 Relational resources and performance

Relational resources are regarded as the LSP's abilities in building close relationships with customers and suppliers. The strategic literature argues that relationships or relational resources are fundamental to business performance (Rumelt, 1984; Wernerfelt, 1984; Hunt, 1997); and they provide economic value to a firm (Hunt, 2001). Relationships with customers and suppliers allow the firm to communicate, collaborate and coordinate customer needs and requirements; Relationships enable a firm to continuously provide the best service to its customers at the lowest possible cost (Porter, 1985; Hunt, 2001).

Basically, relational resources build up essential paths to better understand and meet customer requirements and facilitate a more interactive participation and effective negotiation of logistics contracts. Furthermore, strong supplier-customer relationships allow LSPs to collaborate with business partners and customers, better understanding of each other, and increased commitment on information sharing. Previous logistic literature agrees that the relationships between customers, carriers and vendors allow LSPs to execute and co-ordinate networking and information sharing (Skjoett-Larsen, 2000), and to interact and communicate (Panayides and So, 2005a; Panayides, 2007a) with customers and suppliers. Relational resources allow customers and LSPs to jointly plan, execute and coordinate logistics activities, which will potentially lead to lower cost and higher customer satisfaction (Brewer and Speh, 2000; Mentzer et al., 2000; Karia and Razak, 2007).

The logistics literature highlights that relational resources are highly relevant and important to LSP performance (e.g. Chiu, 1995; Gunasekaran and Ngai, 2003; Panayides and So, 2005a; Panayides, 2007a; Karia and Razak, 2007). Previous literature suggests that the higher the degree of integration with customer-supplier the higher the level of willingness to share and receive information, improve accuracy of information exchange and overall quality (Mentzer et al., 2000; Hertz and Alfredsson, 2004), leading to customer service innovation. A positive relationship between relational resources and LSP performance been reported in an empirical study (Panayides and So, 2005a). Panayides and So (2005a) find that relationship orientation positively affects LSP performance and logistics service quality.

Since collaboration involves human interaction, staff with good communication skills is the main ingredients for a relationship building process to be successful. It is argued that coordination or cooperation between business partners often leads to improved performance (Forza, 1996), lower costs and better delivery performance (Goffin et al., 1997). LSP commitment on sharing information and cooperation has been developed with customers for years. With such good rapport and close relationships LSPs and customers become more willing to share real time order information, or invest in vendor-managed inventory, which is proven to reduce inventory costs (Kuk, 2004). In addition, such strong relationships between customer–supplier will have beneficial operational outcomes such as reduction of inventory, transportation, ordering and warehousing costs (Brewer and Speh, 2000; Mentzer et al., 2000) and often warrant long-term contracts (Min et al., 2005). Panayides and So (2005b) find that relationship orientation is related to supply chain performance such as costs and improved cash flow.

Relational resources are extremely hard to imitate and require an investment of time to develop, to win contracts or to secure continuity of contracts. The development of relational resources and capabilities allow LSPs to understand customer needs and requirements. Relationships are required when logisticians interact with customers or suppliers, when customers make requests for information, changes for delivery, policy or cost charges. Relational resources and capabilities development also take some time to develop because they involve socially complex processes of interactions.

Hence this research proposes hypothesis 4:

> Hypothesis H4: The higher the level of relational resource the greater is the logistics performance in terms of (a) customer service innovation and (b) cost leadership.

3.4.1.5 Organizational resources and performance

In this research, organizational resources are regarded as LSP competences in organizational routines, practices and culture which focus on customer satisfaction and requirements. Organizational resources are essential for LSPs to execute and implement their strategies and objectives into practices and routines. Practices and routines to fulfil customer needs and requirements will provide value-added services. The organizational culture, such as continual improvement, involves top management commitment and trust and encouragement to improve their resources and capabilities to fit to new logistics capabilities. In addition organizational participation and involvement will ensure an LSP's commitment and trust with business partners to provide value-added service and flexibility to customer requirements.

In the strategy literature staying close with customers (Porter, 1980; Peters and Waterman, 1982), having the objective to understand performance (Tomer, 1987) and strategy to improve performance (Barney, 1991) are regarded as organizational resources. RBV theorists argue that organizational resources are a firm's competences in the development of systems, routines, policies, business processes and ways of doing things, which will have positive impacts on strategy and the objectives of a firm (Hofer and Schendel, 1978, Tomer, 1987; Grant, 1991). These organizational resources and capabilities are intangibles resources which are embedded in a socially complex process (Barney, 1991). Certain management systems and routines are essential in reaching customers and providing superior levels of services (Edelman et al., 2005). Firms with better organized systems and approaches appear to be more capable of implementing innovative strategies (Edelman et al., 2005). A positive relationship between organizational resources and the firm strategy of quality/customer service and innovation has been reported in an empirical study (Edelman et al., 2005).

The strategy literature argues that organizational resources are important intangible resources (Hofer and Schendel, 1978; Tomer, 1987; Barney, 1991). Organizational resources allow firms to execute and implement strategies to meet customer requirements leading to sustainable competitive advantage (Barney and Clark, 2007). Organizational resources and capabilities are acquired for better coordination of activities and make effective use of resources and capabilities such as technology, physical and management expertise resources to enhance performance (Amit and

Schoemaker, 1993). For instance, organizational routines to solve customer requirements require management expertise resources to deliberate their strategies and subsequently acquire advanced equipment and logistics facilities to provide their value-added service to customers. Previous studies ascertain that organisational resources, manifested in the forms of culture, routines and service climates, have positive significant impacts on firm performance (Caves, 1980; Barney and Clark, 2007).

The logistics literature acknowledges organizational resources as a key success factor for LSPs (Panayides, 2007a; Karia and Razak, 2007). Organizational resources are needed to develop and achieve LSPs' strategies and objectives into routines and practises. For example, management practices (Brah and Lim, 2006; Ellinger et al., 2008), planning and control systems (Lowson 2003; Gunasekaran and Ngai, 2003), and culture (Sink, 1996; Aldin et al., 2004) are essential in meeting customer needs and providing superior customer service (Daugherty and Pittman, 1995; Aldin et al., 2004; Ellinger et al., 2008). Further, LSP strategies and objectives to understand logistics performance involve organizational encouragement (Lin, 2008) to participate and ensure trust and commitment with their business partners.

The logistics literature suggests that total quality management (TQM) practices (Brah and Lim, 2006) and customer orientation (Ellinger et al., 2008) is regarded as organizational resources. The organizational practices to provide solutions to customers will facilitate the challenge for LSPs to become more responsive and highly flexible in delivery. Such organizational resources help LSPs to have a greater response with customers and increase the quality and reliability of the services as well as reducing cost (Chiu, 1995; Daugherty and Pittman, 1995). Brah and Lim's (2006) survey of 81 LSPs indicates that TQM has a positive correlation with performance. Furthermore, Ellinger et al. (2008) found that customer orientation encourages continuous improvement in logistics service quality which influences LSP performance. This suggests that TQM practices and customer focus have a positive impact on logistics performance.

Accordingly the logistics literature argues that an effective LSP's organizational culture should involve management commitment and involvement in strategic planning (Lai et al., 2008) with an emphasis on customer orientation (Bharadwaj, 2000; Huang et al., 2006) to satisfy customer requirements, provide solutions to customers. Top management commitment and involvement is required to synthesize LSP strategy or objectives into practices and routines which are able to anticipate customer needs and deliver solutions to their problems, or to provide unique services.

In the logistics context, organizational resources and cultures enable an LSP to do things and behave in ways that lead to high sales and low costs or create economic value to an LSP. Some organizational cultures such as customer focus and continual improvement enables firms to do things for employees, customers, suppliers and others, some have attributes and characteristics that are not common to the cultures of a large number of firms (rare); and some are imperfectly imitable to provide sustained competitive advantage. LSPs may develop strategies for customer orientation with the objective to understand customer needs and provide superior levels of service. These can be done by top management's commitment and involvement to synthesize an LSP's strategy or objectives into practices and routines to improve its cost efficiency. For instance, provision of a twenty four hour service for customer requests through email and text messaging or attendance to customers until the goods is delivered.

Hence this research proposes hypothesis 5:

> Hypothesis H5: the higher the level of organizational resource the greater is the logistics performance in terms of (a) customer service innovation and (b) cost leadership.

The above hypotheses on the direct performance effects of RBL represents an important, though not the most significant contribution of this research. One of the distinguishing features of this research is the examination of the bundling or joint effects of RBL. The next section discusses the bundle effects of RBL on logistics performance in term of customer service innovation and cost leadership.

3.4.2 Bundling effects

Bundling of tangible and intangible resources as complementary to each other will most likely enhance greater logistics performance and competitive advantage (Amit and Schoemaker, 1993; Barney, 1991; Teece et al., 1997; Carpenter et al., 2001). The next set of hypotheses is intended to examine the performance impact of RBL bundling. In reality bundles of RBL may, from an RBV perspective, become determinants of LSP performance and means of sustainable competitive advantage (Penrose, 1959; Wernefelt, 1984; Barney, 1991). The bundling of tangible and intangible “resources and capabilities” are believed to be causally ambiguous (Amit and Schoemaker, 1993).

A bundling effect is observed when the performance impact of a resource is significantly improved with the existence of another resource. The exact manner of how two resources together enhance a performance can be ambiguous and, therefore, prevent imitation. The premise underlying this research is that a greater impact is anticipated when all RBL components are bundled in a certain manner to enhance logistics performance.

The RBV theory argues that firms gain superior performance and competitive advantage by developing and deploying unique and idiosyncratic resources and capabilities (Barney, 1991). According to Barney (1991), idiosyncratic resources and capabilities, for example, valuable, rare, inimitable and non-substitutable are determinants of a firm’s performance. The RBV literature in general asserts that firm resources and capabilities are the sources of performance (Penrose, 1959; Wernerfelt, 1984; Barney, 1991; Day, 1994; Teece et al., 1997; Newbert, 2007).

LSP’s RBL have been identified as the determinants of customer service innovation (Myer et al., 1996; Stainer, 1997; Lai et al., 2008; Yang et al., 2009) and cost leadership (Daugherty and Pittman, 1995; Lai et al., 2008). Several logistics literatures argue that both a firm’s tangible (Lai, 2004; Shang and Marlow, 2005) and intangible (Panayides and So, 2005a; Lai et al., 2005; Brah and Lim, 2006; Ellinger et al., 2008) resources and capabilities are positively associated with logistics performance. Some early logistics studies suggest that logistics performance can be explained by a firm’s physical resources, technology resources and managerial competences (Chiu 1995; Sink et al., 1996; Gunasekaran and Ngai, 2003; Brah and Lim, 2006). Skjoett-Larsen (2000) identifies technology, organizational and human resources as key success factors for 3PLs in Scandinavian countries. From a customer point of view, Vaidyanathan (2005) suggests to examine physical, technological and organizational resource as logistics resources. However, previous studies did not consider the combined performance effects of the total logistics resources acquired by an LSP.

The RBV literature (Penrose, 1959; Wernerfelt, 1984) suggests that a firm bundles its resources and capabilities to perform well in its operations. Grounded in the RBV theory, this research expects that RBL can be bundled to enhance logistics performance. This implies that superior performance is dependent on how firms bundle their resources where a different outcome is expected when RBL is bundled differently. The three important assumptions of RBV are applied:

- Each LSP is considered to have a specific collection of RBL to provide the basic foundation for LSP strategy and profitability. These are regarded in the strategy literature as the firm-specific resources and capabilities (Amit and Schoemaker, 1993).
- LSPs acquire and develop unique (idiosyncratic) RBL which is believed to be causally ambiguous, unable to be understood by other providers and, sometimes, by LSPs. Thus, the heterogeneity of resources among LSPs in the logistics industry, meaning the unique differences in the strategic resources they possess (Barney 1991), are regarded in the strategy literature as firm-unique or idiosyncratic resources and capabilities.
- Idiosyncratic LSP RBL is tacit and sticky (imperfectly mobile) resources and capabilities which cannot be transferred from one LSP to another without cost (Wong and Karia, 2010). Thereby, differences in such idiosyncratic RBL resources and capabilities are considered the keys for greatest and competitive logistics performance.

The bundling of certain RBL determines LSPs' logistics performance and sustainable competitive advantage (SCA). According to Amit and Schoemaker (1993), Barney (1991) and Teece et al. (1997), rare and inimitable resources and capabilities may be valuable, but only when resources and capabilities are combined in a particular manner will it lead to a sustainable competitive advantage. For instance, resources which are socially complex and embedded in human capital (e.g. management expertise resources) or structure capital (e.g. organizational resources) are most likely to generate sustainable competitive advantage when they are bundled with other resources to complement each other (Barney, 1991; Teece et al., 1997).

Thus this research posits that the bundling of certain tangible and intangibles resources may derive causal ambiguity and results in differences in LSP performance. The bundling effects will be difficult for other competitors to replicate, leading to enhanced logistics performance in terms of customer service innovation and cost leadership and eventually sustainable competitive advantage. Based on RBV theory and previous studies, an RBL bundling model is proposed in Figure 3.2.

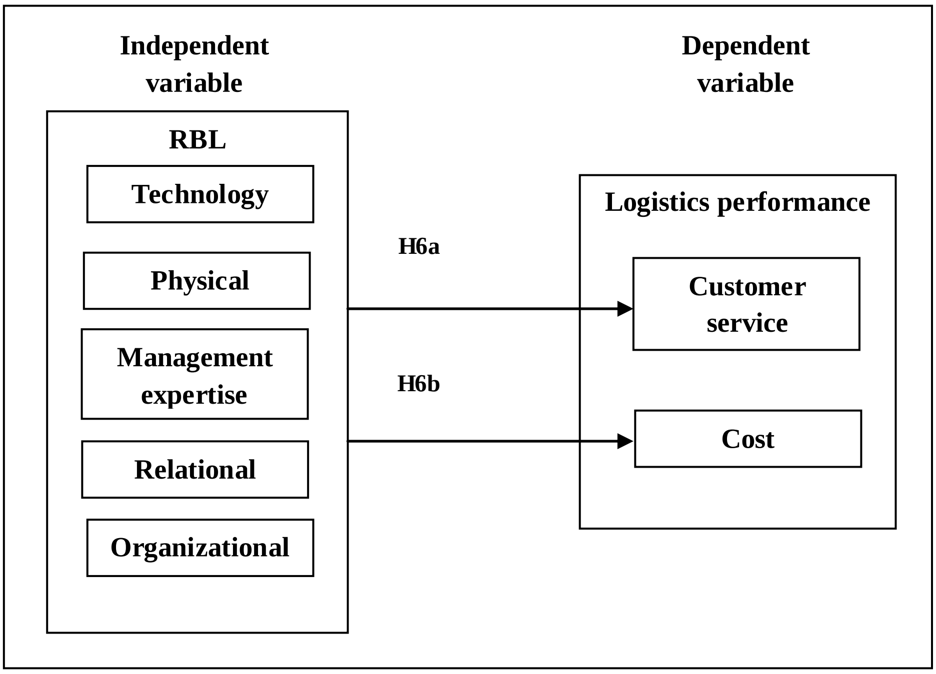


Figure 3.2: The RBL bundling model

The above five RBL are regarded as capabilities acquired, provided and developed by an LSP. They are technology, physical, management expertise, relational and organizational resources which, independently, have a direct effect on logistics performance in terms of customer service innovation and cost leadership. This research argues that business logistics cannot be operated independently without the bundling of the above resources and competences; resources have no real value to the firm when they act in isolation (Eisenhardt and Martin, 2000). Some resources, themselves, are insufficient to impact performance; so they should be bundled together to achieve firm performance (Nelson and Winter, 1982; Makadok, 2001).

For example, it is argued that collaboration is a result of human interaction which can only be supported by IT and knowledgeable employees (Lai et al., 2005). To deliver such collaboration LSPs need management expertise resources and organizational resources (Sanders and Premus, 2005). Furthermore, technology resources and capabilities are developed to provide better logistics services which lead to greater customer service innovation; and management expertise resources and capabilities are developed to utilize LSP technology and physical resources more effectively to achieve cost leadership.

Hence, it is possible that the technology and physical resources acquired by LSPs may allow LSPs to acquire higher management expertise resources and capabilities to facilitate their logistics performance. LSPs acquire technology resources for their effective interaction and communication which subsequently promotes or actively develops management expertise resources. The advanced technology resources allow LSPs to acquire calibre staff to fit into new changing environments. As technology keeps growing, LSPs should be able to develop and calibrate more advanced management expertise resources than competitors. Advanced physical resources may also allow LSPs to acquire technical and knowledgeable people to handle and ensure cost efficiencies. However there is a lack of theory and justification to explain these relationships between each RBL, hence the links between them is not included in the model but they are tested in the post-hoc analyses.

This research suggests that each RBL needs to be bundled with some specific RBL to enhance both customer service innovation and cost leadership. This research argues that in some cases LSP resources and capabilities might be effective only when bundling with some combinations of RBL composites. Bundling of resources empowers LSPs to operate its logistics business strategically to improve customer service innovation and cost leadership improvement. Logically, some specific RBL bundles might lead to enhanced customer service innovation and different RBL might be acquired for cost leadership. A positive relationship has been reported in an empirical study on the performance impact of bundling certain logistics resources (Huang et al., 2006; Lai et al., 2008; Yang et al., 2009). Huang et al. (2006) find that a bundle of IT-infrastructure, human IT-resources and IT-enabled intangible (emphasizing on customer orientation, better coordination, responsiveness) such as industrial firm's IT capability in Taiwan. These firms' IT capability leads to a positive relationship with firm performance. Furthermore, a bundle of technology orientation, resource commitment and managerial involvement such as 3PL IT capability leads to a firm's competitive advantage (Lai et al., 2008). Yang et al. (2009) find that container shipping service firms bundled information equipment resources, corporate image resources and network resources as the firms' resources and capabilities have a positive correlation with logistics service capability and innovation.

Hence this research proposes hypothesis H6:

Hypothesis H6: the bundling of certain RBL will lead to greater logistics performance in terms of (a) customer service innovation and (b) cost leadership.

3.5 Summary

The chapter attempts to conceptualize RBL, logistics performance and develop hypotheses on the relationships between RBL and performance. The conceptualization of theoretical frameworks described in this chapter enables the development of hypotheses and determines the operational measurement of various logistics resources. The first step defined RBL and each resource and establish measurement items for each resource. The second step established the direct relationship between each RBL and logistics performance; followed by the bundling effects of RBL in logistics performance. The following chapter describes the methodology of this research, which encompasses the research design, measurement of variables and the data analysis which are applied for this research.

CHAPTER 4: METHODOLOGY

4.1 Introduction

This chapter presents the research methodology used in this research. It defends the methods used to achieve the research objectives and to find answers to the research questions. The positivistic paradigm and the inductive and deductive approach used in this research are defended as the best available methods to fulfil the research objectives. Specifically, this chapter will elaborate on the development of the research methodology by focusing on the data to be collected, the data sources, the method of collection and the analysis that was used to empirically test the proposed hypotheses. Detailed sources of the items, constructs and measures used are provided in the discussion section. Lastly, there is a description of the appropriate analytical technique used. This section focuses on the specific data analyses employed.

4.2 Research Approach

4.2.1 Research concepts

Naturally, different people have different perspectives; hence, the way people view the world has implications for their research. The idea of a world-view is one such path towards a paradigm of thought or action. The concept of a paradigm can be used to represent a number of issues; for example, it may include value judgments, norms, standards, frames of reference, perspectives, ideologies, myths, theories and the approved procedures that govern people's thoughts and actions (Gummesson, 2000). According to Mangan et al. (2004) a paradigm is central to the research process in all areas of study. Table 4.1 summarizes the different assumptions of the paradigm (Creswell, 1994). The positivist and phenomenologist paradigms are two different paradigms which naturally enrich the range of options that are available. They can offer alternative approaches to resolving research problems and, thus, they provide ways to further advance and develop research. The nature of the research problem and the research goals are what guide the researcher in choosing an appropriate methodology. Consequently there will be certain epistemological and ontological assumptions that influence the methodological (how we gain knowledge about the world) decisions of the researcher. The choice of ontology (whether objective or subjective) is related to the epistemological considerations of the research because these considerations represent the link between the researcher and that being researched.

Table 4.1: Research paradigm

Research Paradigm			
Creswell (1994)	Question	Quantitative	Qualitative
Ontological	What is the nature of reality	Reality is objective, apart from the researcher	Reality is subjective and multiple as seen by participants in a study
Epistemological	What is the relationship of the researcher to that researched?	Researcher is independent from that being researched	Researcher interacts with that being researched
Axiological	What is the role of values?	Value-free and unbiased	Value-laden and biased
Rhetorical	What is the language of research?	Formal	Informal
		Based on set of definition	Evolving decision
		Impersonal voice	Personal voice
		Use of quantitative words	Use of qualitative words
Methodological	What is the process of research?	Deductive process	Inductive process
		Cause and effect	Mutual simultaneous shaping of factors
		Strategic decisions	Emerging design – categories identified during research process
		Context-free	Context-bound
		Generalisations leading to prediction and understanding	Pattern, theories developed for understanding
		Accurate and reliable through validity and reliability	Accurate and reliable through verification

This research examines resource-based logistics (RBL) within LSPs and determines its impact on logistics performance. Since this research is explorative in nature it is appropriate to identify, conceptualize and measure logistics resources accessed by LSPs, and further examine their impacts on logistics performance. It means that this research will emphasize the measurement and analysis of causal relationships between variables using research methods such as surveys (Collis and Hussey, 2003).

This research is subject to the natural laws that humans discover in a logical manner through empirical testing: it uses inductive and deductive processes to derive hypotheses from a body of scientific theory which is to be tested using large samples. The ontological stance of this research assumes that an objective reality (realist ontology) exists; in other words, it assumes that knowledge is gained from sense data which can be directly experienced and verified between independent observers. Further, the aim of this research is to explore the causal relationships between the identified variables. Thus, from an epistemological standpoint this researcher adopts a positivist paradigm approach in which the researcher is independent from that being researched (Creswell, 1994; Burrell and Morgan, 1979). The growth of knowledge is a cumulative process whereby new knowledge is added to existing knowledge and false hypotheses are eliminated (Naslund, 2002).

4.2.2 Research paradigm

The research philosophy or paradigm will depend on the world view of the researcher. How he/she understands the thoughts and actions that lead to the development of knowledge (Collis and Hussey, 2003). In logistics, the bulk of the literature is primarily based on quantitative research viewed through a positivist lens (Mentzer and Khan, 1995; Naslund, 2002; Mangan et al., 2004). Indeed, when it comes to the study of logistics measures, the survey questionnaire has been the most popular research method, followed by the case study (Table 4.2).

Rather than relying on the survey data alone, recent logistics researchers have combined both qualitative and quantitative methodologies in logistics research (e.g. Naslund, 2002; Mangan et al., 2004). This method is called triangulation. They argue that the triangulation of research methods lends greater empirical support to the theory in question. Mangan et al. (2004) argue that this research method provides multidimensional insights and yields greater insights into the phenomena being researched. Thus it is necessary to use both qualitative and quantitative methodologies if researchers really want to develop an advanced logistics research (Naslund, 2002). Indeed, logistics research is influenced by economic or behavioural approaches to scientific study and data is primarily obtained via questionnaire, interview and case studies (Mentzer and Kahn, 1995).

Table 4.2: Summary of the logistics literature on RBL and methodology approach

Author	Methodology	The objective of the study
Chiu (1995)	A case study & Survey: 45 Distribution	To formulate framework for distribution firms

	companies (Retailers)	
Myers et al. (1996)	Survey: 197 manufacturing firms	To investigate the relationship between the production efforts of US firms within the CBI nations and the logistical performance of those firms in supporting their manufacturing endeavours
Gunasekaran and Ngai (2003)	A case study of small 3PL in Hong Kong	To identify critical success factors for a small logistics company
Panayides and So 2005a Panayides (2007)	Survey: 251 LSPs in Hong Kong	To examine the influence of relationship orientation on logistics service quality and firm performance
Sanders and Premus (2005)	Survey: 245 manufacturing firms	To propose and test a model of the relationship between firm IT capability, external and internal collaboration and firm performance
Shang and Marlow (2005)	198 manufacturing firms	To examine the relationship among logistics capabilities, logistics performance and financial performance
Brah and Lim (2006)	Survey: 81 LSPS	To examine the relationship between individual quality management, technology and business performance
Lai et al. (2006)	Survey: 105 3PL in China	To examine the impact of IT on the competitive advantages

To fill the research gap, this research seeks to identify logistics resources through literature review and the use of semi-structured interviews. The aim is to derive substantive justification and, in particular, to develop research questions that are aimed at understanding what logistics resources are acquired by LSPs (RQ1) or which resources are parts of logistics resources. The search to identify categories or to describe logistics resources in general is a suitable way to understand logistics resources from the viewpoint of a logistician who is directly involved in the activities being researched (Denzin and Lincoln, 1994). This is the logical induction process which is used to establish substantive justification in this research (Mentzer and Khan, 1995).

In addition, the relationship between logistics resources and logistics performance as examined by using large samples remain under-investigated. To fill this research gap, this research attempts to develop the necessary theoretical framework and hypotheses and to further test these hypotheses through the use of a survey questionnaire. This is the logical deduction process which is used to explain causal relationships between the variables under investigation (Saunders et al., 2003). This is suitable for testing empirical hypotheses which place emphasis on the analysis of validity and reliability issues, as suggested by Mentzer and Khan (1995).

In conclusion, the philosophical paradigm of this research is positivism: the researcher assumes that reality is subject to natural laws that humans discover in a logical manner through empirical testing. This research uses hypotheses and tests them by using large samples. The use of survey data with interviews in the same study is a more profound form of research approach (Hussey and Hussey, 1997; Olsen, 2004). Interviews, rather than surveys alone, provide greater insights about logistics resources in LSPs.

4.3 Methodology Approach

This section discusses the search for scientific research methodologies or approaches or research strategies to answer the following four research questions established in Chapter 1:

RQ1: What are logistics resources acquired by LSPs?

RQ2: What are the LSPs' logistics performances and the impact of logistics resources acquired by LSPs on such performance?

RQ3: How are these logistics resources affecting the logistics performance of LSPs?

RQ4: How to manage these logistics resources to achieve a high level of logistics performance?

Table 4.3 provides relevant situations for different research strategies (Yin, 2003). In regard to this research, the "what" and "how" research questions are likely to favour the use of case studies and surveys, particularly for contemporary events like logistics businesses. This indicates that a survey strategy is the best way to seek answers to the research questions addressed in this research. This method allows the collection of a large amount of data from a sizeable population in an economical manner (Saunders et al., 2003).

Table 4.3: Relevant situations for different research strategies (Yin, 2003)

Strategy	Form of Research Question	Requires Control of Behavioural Events?	Focuses on Contemporary Events?
Experiment	How, why?	Yes	Yes

Survey	Who, what, where, how many, how much?	No	Yes
Archival analysis	Who, what, where, how many, how much?	No	Yes/No
History	How, why?	No	No
Case Study	How, why?	No	Yes

A survey is the most appropriate method to generalize the study findings and to test the hypotheses that have been developed (Collis and Hussey, 2003; Walker, 2005; Bryman and Bell, 2007). The survey captures relevant resource-based logistics that exist in logistics organizations. It is an appropriate tool to discover what a large number of managers think about the RBL issue and its relation to logistics performance. It is also instructive in terms of providing information on how these groups of managers report their thoughts and experiences via the survey questionnaire or the structured interview. This method is consistent with the values and opinions of the dominant researchers within the field (Lai et al., 2005; Brah and Lim 2006; Panayides, 2007b).

This method allows the collection of rich data on the characteristics of resource-based logistics acquired by LSPs and the key characteristics of logistics performance. This will provide answers to research questions RQ1 to RQ4. The research also uses the literature review, survey questionnaires and interviews to answer research RQ1 to RQ4. This method allows the collection of a large amount of data from a sizeable population in an economical and effective manner (Saunders et al., 2003). A survey using a questionnaire provides the best fit for this research; however this method provides limited information as it requires a large sample which is time consuming and costly.

Interview is another methodology that is considered. The purpose of using interviews is to study how people understand their experiences or to elaborate on their perspectives. This approach is a great way to learn detailed information from the experiences of logisticians. It is a useful method for gaining the opinions of experts who will describe their experiences with the key characteristics of the firm's RBL. So the interview method allows logisticians to describe in detail RBL characteristics and their own experiences. The interview findings are used to answer research questions RQ1 and RQ2 specifically. Further, the research also uses interview findings to verify constructs and items developed from the literature review and to give general answers to research questions RQ2 and RQ4. This method allows managers the flexibility to describe what, how and why, in order to provide answers to two questions based on the experiences, knowledge and expertise of logisticians. The questions are ‘what are logistics resources acquired by LSPs and ‘what are the LSP’s logistics performance? The objectivist grounded theorist view uses interview questions as a means for gathering facts (Charmaz, 2003). However, this method is expensive and conducting interviews is time consuming and the interview data is difficult to analyze and interpret. Table: 4.4 summarize the strength and weakness of the interview and survey methods.

Case study is another methodology to be considered. It examines contemporary phenomena (real-life situations, issues or problems). According to Yin (1994) case study research investigates phenomena within its real-life context in which the boundaries between phenomenon and context are not clearly evident and multiple sources of evidence are used. Case studies allow for rich description and rich triangulation where multiple sources of data (verbal reports, observations and archival records) enable a wider understanding of phenomenon. It involves a single-industry and a firm participating in that industry. However the case study is not considered in this research. The weakness of the case study method is that a small number of cases are unable to offer sufficient data to establish reliability or generality of findings, except with the addition of more variations in places, people, and procedures. A case study can withstand and still yield the same findings, the more external validity is provided. A case study is useful as an exploratory tool.

Thus, this research employs the use of survey data with interview data as this method combines information from quantitative with information from qualitative data which is a more profound form of research approach.

Table 4.4: Strength and weakness of survey and interview methodology

	Strength	Weakness
Interview Charmaz (2003)	Face-to-face validity Two-way communication Allow manager to describe what resources are meaningful and important Have the flexibility to use their knowledge expertise	Respondent’s behave differently dependent on the interview style (data invalid) Training interviewer and conducting interview can be expensive and time consuming More subjective

		Analyzing and interpretive qualitative interview is much more time consuming Often difficult Require expertise Over-loaded information
Survey Collis and Hussey (2003) Look at the variation in data or learn about a large population thinks	Survey instrument is administered Easier to analyze Provide possible responses More rigid	Large group Provide limited information

4.4 Methodology Application

4.4.1 Data collection

In this research, data collection focuses on logistics service providers (LSPs). This simultaneously meets the research objective for understanding logistics resources from the perspective of providers. It means that the research context is LSPs. The population frame for this research is drawn from Malaysian LSPs (see detail in 4.3.3). For accessibility purposes, Malaysia is chosen as the research field for this research. As the exact number of LSPs in Malaysia is not known, the company listing in the Malaysia Logistics Directory (www.msialogistics.com) is used as a database to develop a representative sampling frame. This research employs two methodologies: interview (4.4.2) and survey (4.4.3).

4.4.2 Interview

The approach to data collection for interviews involves four parameters as suggested by Miles and Huberman (1984): the setting (where the research will take place); the actors (those who will be interviewed); the events (what the actors will be interviewed about); and the process (the evolving nature of events undertaken by actors within the setting). Hence,

a) Setting – Malaysia
b) Actors – eight managers of seven LSPs were interviewed
c) Events – they were interviewed about the kinds of resource acquired by LPSs for logistics operations in the context, what resources can enhance logistics performance or what kind of resources were acquired to run their logistics businesses

d) Process – the interview events are discussed

Fifteen logistics managers of logistics companies were selected from the listed companies in the Malaysia Logistics Directory (www.msialogistics.com) for the semi - structured interview. The purpose of the interviews with logistics managers is to answer such questions as "what are logistics resources acquired by LSPs (RQ1)" and "what are the LSPs' logistics performance? (RQ2)". The interviews were conducted in order to acquire feedback on the kinds of resources that are acquired in the context of logistics providers.

This research requires that respondents are willing to be interviewed. Prior to conducting the interviews, the researcher made several phone calls to the fifteen selected companies. The purpose of the calls was to introduce the researcher and the event. Ten out of fifteen logistics managers agreed to be interviewed and gave their contact number (personal email or mobile number). Then several calls were made to arrange appointments and to clarify certain details such as the dates, times and places for the interviews. In total, eight out of ten informants from seven logistics companies were interviewed.

For reasons of ethical consideration, the researcher made an introduction and explained the issue of confidentiality and informed consent. Logistics managers were fully informed about the research objectives and why their knowledge and their experiences regarding resources were important to the study. They understood my objectives and were willing to share their experiences. Most of the interviews were held at their place of work; this was due to the nature of their work which required them to respond immediately to phone calls and emails. Details of the field interviews are in the diary as presented in Appendix A.

The interview schedule is developed from the literature review which focuses on two areas: tangible resources (physical and technology); and intangible resources (relational, organizational and management expertise). Questions are aimed at addressing how to understand the kind of resources acquired by LSPs for their logistics operations. As requested, no interviews were recorded, with the exception of one, which (with permission) was recorded and fully transcribed and used in research. Thus, for the unrecorded interviews, the researcher had to make written notes of any common information that was highlighted by experts during the interview sessions. All interviews lasted from half an hour to under two hours. The interview transcripts are not presented in Appendices.

The face-to-face interviews were conducted between February and March 2009. The interview was conducted on a face-to-face basis with informants selected on the basis that they were best able to answer the research questions RQ1 and RQ2 as formed in Chapter One. Their answers also support the literature on emergent themes as built up in the conceptual framework. A semi-structured interview with eight informants from seven logistics companies was conducted specifically to establish constructs and the measures of logistics resources (RBL).

4.4.2.1 Content Analysis

The interview data is transcribed into written form in order to conduct a thematic analysis. The seven transcripts are verified by individual managers. Then the text is coded into manageable categories based on five themes. The development of a coding scheme is based upon the operational definitions of different resources established in Chapter 2. The theoretical framework, developed in Chapter 3, forms the foundations of the coding scheme in Table 4.5. To ensure a high level of objectivity and transparency, clear decision rules are pre-defined to avoid ambiguous categorization (Cullinane and Toy, 2000; Krippendorff, 1980). For relational resources the coding for implicit terms is complicated by the need to base judgment on a somewhat different indicator theme for dealing with establishing basic relationship requirements. It is categorized into established relationships which require contacts or networks, and communication skills to share, negotiate and bargain. Organizational resources are categorized as follows, commitment to customers (satisfaction, requirement, and solution) and compliance with procedures or processes. Management expertise resource is categorized into developing people; this requires hiring staff (experienced, multi-experienced staff, staff with logistics skills) and providing training.

The interview point in the transcript is highlighted with the themes at comment column (refer to transcript). The themes identified are not necessarily the most prevalent themes across the data set but they capture an important element of the way in which LSPs acquire resources. It is not necessarily dependent on a quantifiable measure but rather on whether it captures something important in relation to the research question, RQ1 and RQ2. Finally, the reliability of the coding instrument is ensured by the pre-defined decision rules by underlined text in interview transcripts.

Table 4.5: Coding scheme for thematic analysis

<table>
<tr><th>Indicator: Theme</th><th>Pre-defined themes</th><th>Decision rules for ensuring objectivity, validity and reliability</th></tr>
<tr><td>Physical</td><td>Define theme
Logistics infrastructure: equipment, trucks, warehouse, space floor, transportations, pallet truck, asset, haulage, container yard, rail
IT infrastructure – computer, hardware and software</td><td rowspan="6">Objectivity
• Identified themes that captured resources acquired
• For ambiguous categories (e.g. relational, organizational and management expertise), clear decision rules are defined.
• Resources acquired are summarized in Appendix B for ensuring transparency

Validity
• All themes and pre-defined themes are based on the theoretical framework and resource-based view

Reliability
• The coding instrument is ensured by the pre-defined decision rules
• Keep the evidence collected for justification so the methods used become transparent
• Cross checking</td></tr>
<tr><td>Technology</td><td>New or advanced technology equipment/facilities
Advanced technology and information technology and systems
Web-based information systems</td></tr>
<tr><td>Management Expertise</td><td>Staff experience wise, expertise, multitasking, best people (calibre), training, skill, education background</td></tr>
<tr><td>Relational</td><td>Establish relationship, build up contact or network, good rapport (buddy or close friend), communication skills for negotiation, sharing information</td></tr>
<tr><td>Organizational</td><td>procedure, routine, policy (safety equipment policy), commitment on customer satisfaction or requirements, provide solution</td></tr>
<tr><td>Performance</td><td>growth, productivity, cost, customer service, service innovation</td></tr>
</table>

4.4.3 Survey

4.4.3.1 Population and sample size

A list of 800 logistics companies from the *Malaysia Logistics Directory* of Marshall Cavendish (Malaysia) Sdn. Bhd. (www.msialogistics.com) was compiled as the exact number of LSPs in Malaysia is not known. The population frame for this research is drawn from Malaysian LSPs which includes company who perform part, integrated or full logistics services such as warehouse management, shipment consolidation, customs brokerage, transportation/distribution management, inventory management, freight forwarding and customer service. By using this initial list as a sampling frame, the researcher obtained the contact names and numbers. In systematic, random sampling, the first contact number in the list is called in order to request respondents who are willing to be surveyed. Given that this research is based on a quantitative approach, large samples are needed to ensure greater reliability of the main analytical technique used in this research.

Using the initial list of 800 cases as a sampling frame, the researcher obtained details of the names, contact numbers and the addresses. All of them were initially contacted by telephone to explain the purpose of the study and to ascertain their willingness to participate. 354 companies were reached using the contact number provided and 289 companies agreed to participate. Eventually only 125 companies such as Malaysian, joint venture and non Malaysian owned companies participated in this study. Three reasons were cited as follows to explain their eventual refusal to participate: (1) not willing to disclose information; (2) not able to spare time; and (3) never have this kind of survey.

The key informant for this research is a member of an organization who has specific knowledge, and is in a position to report on the phenomena being studied. For each LSP, the respondents were selected from assistant manager level to the chief executive officer where they are deemed to be in control of the resources and performance of their business unit.

Concerning the formalities, the researcher was approved as a registered researcher by the Malaysian Economic Plan. This status allowed the researcher entry into company premises. The survey was undertaken by a personal visit to ensure that the questionnaire was completed by the intended respondent. Therefore, one assistant researcher was employed to meet with respondents at their own convenience, at a time and place decided by respondents themselves. On average, 20 completed surveys were received within a month and arrangements were made for 20 forthcoming meetings. Thus the survey took more than 6 months to complete.

4.5 Research Instrument

A survey questionnaire is designed to elicit responses from the respondents in respect of their views on the extent of RBL in their respective companies. As empirical studies in RBL are still very much under-researched, the design of the questionnaire items and the measurements were developed based on an existing body of earlier conceptual studies. These studies contributed information on the key logistics resources, complemented by additional items that were gathered from affiliated streams of literature, such as the human capital and the resource based-view; and data on semi-structured interviews. To make all the constructs more valid and reliable, the draft questionnaire was sent to experienced researchers in the field of logistics, supply chain and operations management. For further reliability and validity, the questionnaire was piloted on a few logisticians. This research utilized the closed response approach where respondents are required to respond to a 5-point Likert scale, giving a specific response to a statement.

4.5.1 Constructs and measures

To measure RBL and logistics performance, this research has developed items based on the logistics and strategy literature that is presented in Chapter Two as comprised in related table 2.1 and 2.2 and also in the interview data. The components that made up RBL are measured by physical resources, technology resources, relational resources, organizational resources and management expertise resources (Table 4.6). Respondents are required to assess the level at which they strongly disagree (1) and strongly agree (5) on the Likert scale (Likert, 1932; Dunn et al., 1994; Stock, 1997). The measurement for performance is captured by using non-financial indicators based on cost, customer services (quality, delivery and flexibility) and innovation. The scale employed as the measurement is a Likert-like measure represented by a set of levels at which they strongly disagree (1) and strongly agree (5). The following section discusses each RBL construct.

Technology resources refer to advances in technology, IT and IS and equipment (Chapman et al., 2003; Brah and Lim, 2006; Lai et al., 2008) as well as continuous adaptation, improvement and innovation in IT and IS; and equipment and facilities (Lowson, 2003; Wu et al., 2006; Lai et al., 2008). These technology resources enable competencies in innovation capability to control logistics activity such as communication, transmission, processing of information and delivery. Such technology resources are also regarded as an LSP’s ability to execute improvements in logistics equipment and technology usage to keep up with most up-dated advanced IT and IS or the most sophisticated technology (Wu et al., 2006). They enable information to be accessed and used by various parties in the logistics network. Five technology resource items are developed on a 5-point Likert scale. The scale requires respondents to assess the technology resource levels in their business units.

Physical resources are measured by items relating to logistics infrastructure and IT infrastructure as well as ongoing maintenance and improvement in physical resources. The logistic infrastructure such as equipment; and facilities such as warehouses and transport vehicles are used for effective delivery (e.g. Stefansson, 2006; Lai, 2004), and the IT infrastructure such as computer hardware and software or any relevant IT facilities (Chapman et al., 2003; Alshawi, 2001; Aldin et al., 2004; Yang et al., 2009) are used to support the logistics operation and activities. For example, vehicles, distribution centres or logistics networks, warehouses, bases and vessels are the facilities and equipment that are necessary for the company-wide activities of inventory, transportation and warehousing (e.g. Closs & Thompson, 1992; Murphy & Poist 2000; Stefansson 2006; Bowersox et al., 2007). Five physical resource items are developed on a 5-point Likert scale. The scale requires respondents to assess the physical resource levels in their business units.

Management expertise resources refer to acquisition, recruitment, hiring and development of skilled people and integrated teams with technical ability, knowledge and experience (Penrose, 1959; Rueber, 1997). The ability to acquire such resources depends greatly on management commitment to human resources to develop or retain best people, for example, bring in new people with expertise, skills and experience and recruit workers with logistics skills and knowledge from the same industry or with multi-experience workers (Rueber, 1997). These enable LSPs to manage an organization and ultimately to achieve organizational objectives (Mayo, 1933; Penrose, 1959; Prahalad and Hamel, 1990; Barney, 1991; Grant, 1991). Rueber (1997) suggests specific skills (context-specific), multiple experiences (types of experience leading to the acquisition of multiple expertise), concrete experience (not the duration of experience), and the continuous acquisition and development of skills. Six management expertise resource items are developed on a 5-point Likert scale. Respondents are required to assess the management expertise resource levels of their business unit.

Relational resources refer to coordination and collaboration with trading partners such as suppliers, manufacturers, distribution centres, customers and logistics service providers (Skjoett-Larsen, 2000; Sander and Premus, 2005; La Londe and Master, 1994). This collaboration and coordination involves formal and informal communication (House and Stank, 2001) and frequent communication (Panayides and So, 2005b) which require highly acquired workers with good communication skills to interact and negotiate with customers and suppliers effectively. These enable mutual and long term relationships (partnerships) (Londe and Master 1994; Gunasekaran and Ngai, 2003). Five relational resource items are developed on a 5-point Likert scale. The scale requires respondents to assess the relational resource levels in their business units.

Organizational resources refer to the competences in the organizational culture that stay close to customers (Porter, 1980; Peters and Waterman, 1982), with the objective of understanding logistics performance (Tomer, 1987) and with a strategy to improve performance (Barney, 1991). These organizational resources and capabilities are intangible resources which are socially complex processes (Barney, 1991). Items relating to decisions, competence, culture, routines, policies, business processes and ways of doing things will add value and result in service and customer satisfaction. They are formulated based on continual improvement (Skjoett-Larsen, 2000), customer solutions (Sink et al., 1996; Daugherty and Pittman, 1995), safe operations (Lowson, 2003; Gunasekaran and Ngai, 2003) and they focus on customers, customer satisfaction and TQM practices (Brah and Lim 2006). These issues of organizational resources are translated into planet (environmental); people (customer satisfaction); and profit (the ability to deliver, value-added, quality and sustainable service). Six organizational resource items are developed on a 5-point Likert scale. Respondents are required to assess the organizational resource levels of their business unit.

Logistics performance: Cost (e.g. Daugherty and Pittman, 1995; Myer et al., 1996; Fawcett and Coper, 1998; Sanders and Premus, 2005; Brah and Lim, 2006), customer service (delivery, quality and flexibility) (e.g. Myer et al., 1996; Stainer, 1997; Wilding and Juriado, 2004; Brah and Lim, 2006) and innovation (Myer et al., 1996; Stainer, 1997; Sanders and Premus, 2005). All of these items have been used to measure logistics performance. Hence the construct of "logistics performance" is said to be made up of the following items. These are: cost of distribution facility and labour; customer service components: delivery, quality and flexibility; and service innovation. Nine items are developed on a 5-point Likert scale. Respondents are required to assess the extent of agreement on the total performance measurement of their business unit.

Table 4.6: Constructs and measures of RBL components and logistics performance

Constructs	Items	Sources
Technology resource	Information systems management (tracking and tracing shipment information) web-based information system	Lai (2004), Lai et al. (2005)
	Improvement in technologies Improvement in IS and IS	Lowson (2003) Lai et al. (2008)
	Advanced equipment and facilities: Automated materials handling equipment, automated storage	Brah and Lim (2006)
	Up-to-date technology Adopt sophisticated technology	Chapman et al. (2003) Wu et al. (2006)
	Advanced IS and IT Advanced technology – ICT via internet	Lai et al. (2008)
Physical resources	Facility and equipment, tools	Penrose (1959) Wernerfelt (1984) Barney (1991)
	Logistics infrastructure: movement facilities and hardware facilities: Warehouse, transportation operations and packaging equipment	Closs & Thompson (1992), Stainer (1997), Wouters and Sportel (2005), Stefansson (2006), Bowersox et al. (2007); Lai (2004)
	Facilities and equipment improvement and maintenance	Lowson (2003)
	IT infrastructure – Physical IT, asset-computer, communication technologies IT tools (EDI) or EDI facilities (bar-code, RFID)	Bharadwaj (2000) Huang et al. (2006) Alshawi (2001) Aldin et al. (2004)
	Hardware and software, peripheral and communication systems	Chapman et al. (2003)
Management expertise resources	Experience Knowledge Training Skills	Mayo (1933), Penrose (1959), Becker (1964), Rueber (1997)
	Top management commitment on investment in human resources	Skjoett-Larsen (1999)
	Developing people with appropriate education and training	Drew and Smith (1998)
	Management expertise – providers employ experienced professionals to manage all aspects of supply chain	Murphy and Poist (2000)
	Firms hire or recruit people who have new skills, knowledge and quality Knowledge –seek new knowledge and expertise	Poist et al. (2001) Razzaque and Sirat (2001) Chapman et al. (2003)

	Skills and experience in relevant field	
Relational resources	Close relationship with trading partners	Chiu (1995)
	Partnership – cooperation, collaboration, information sharing and trust Relationship networks – collaboration, coordination Partnerships, customer relationship	Larson and Kulchitsky (1999) Chapman et al. (2003) Gunasekaran and Ngai (2003)
	Relationship networks – collaboration, coordination	Panayides and So (2005a) Chapman et al. (2003)
	Communication	Panayides and So (2005a) House and Stank (2001)
	Mutual relationships	La Londe & Master (1994), Chen and Paulraj (2004)
	Long term relationships (partnerships)	La Londe & Master (1994), Gunasekaran and Ngai (2003)
Organizational resources	Decision, competent, policy, corporate culture, practices, business process	Hofer and Schendel (1978), Tomer (1987), Hunt (2001)
	Commitment of top management and continuous improvement Organizational encouragement Managerial involvement	Chiu (1995) Lin (2008) Lai et al. (2008)
	Stay close to customers Eemphasis on customer orientation Reputation - ability to provide required services or tailor to a customer's specific needs	Porter (1980); Peters and Waterman (1982) Bharadwaj (2000) Huang et al. (2006) Sink (1996)
	Managerial practice (TQM culture)	Brah and Lim (2006)
	Strategic planning, repeat customer visit	Gunasekaran and Ngai (2003)
Logistics Performance	Customer service (delivery, quality and flexibility) Service Innovation	Myer et al., (1996), Wilding and Juriado (2004), Brah and Lim (2006) Stainer (1997), Myer et al. (1996), Sanders and Premus (2005),
	Cost	Daugherty and Pittman (1995), Myer et al. (1996), Fawcett and Coper (1998), Sanders and Premus (2005), Brah and Lim (2006)

4.5.2 Questionnaire Design

This survey utilized the closed response approach in which respondents are required to respond to the Likert 5-point scale – strongly agree, agree, neither agree nor disagree, disagree, strongly disagree (Likert, 1932; Dunn et al., 1994; Stock, 1997), by giving a specific response to a statement or putting a tick against a specific statement. The questionnaires are designed such that the questions are kept brief and simply worded so that respondents are encouraged to complete the survey items.

The survey questionnaire is divided into four sections (Table 4.7). First, Section A comprises questions relating to each component of RBL. These components are namely, physical, technology, management expertise, relational and organizational resources. Section B comprises questions about the performance of the company when compared with its competitors and the financial performance of the company in terms of growth, delivery and length of contract. Further, Section C is intended to obtain specific demographic details about the profile and background of the company. Section D is an attempt to have the demographic of the respondent profile. A sample of the survey questionnaire is attached as Appendix D.

Table 4.7: Questionnaire design

RBL components		No. of item	Question Number
Section A	Resource-based logistics		
Tangible	Technology	5	A5, A6, A7, A21, A27
	Physical resource	5	A2, A3, A17, A18, A24
Intangible	Management expertise	6	A1, A4, A8, A11, A16, A30
	Relational	5	A9, A10, A15, A23, A26
	Organizational	9	A12, A13, A14, A19, A20, A22, A25, A28, A29
Section B	Logistics performance		
	Cost	3	B1, B4, B7
	Customer service	3	B2, B5, B9
	Innovation	3	B3, B6, B8
Section C	Company profile		
Section D	Respondent profile		

4.5.3 Pilot Study

A pilot survey is tested with professional practitioners as well as academics to ensure that the instruments are free of ambiguity and are readable. Based on feedback from the pilot test, questionnaire surveys are refined and a revised final questionnaire is developed.

This is considered as a pioneering study in empirical research on RBL and logistics performance. As such, it is deemed necessary to pre-test the effectiveness of the research methodology and the appropriateness of the content, wording and layout of the questionnaire so that any potential problems that might arise in the course of the larger study could be identified. The objective is to detect any possible shortcoming in the design and administration of the questionnaire (Lakhal et al., 2005). To have the highest degree of reliability and validity (Okpara and Wynn, 2008) the questionnaire is piloted on eleven logisticians. Based on the pilot study some adjustments are made to the wording and the layout of the questionnaire. First, leading and ambiguous questions are re-worded to avoid confusion and to enhance understanding of the questionnaire items. In particular, any double-barrelled questions are adjusted according to the item being constructed. A question can either be separated into two questions or it can have the same meaning. Second, in the original questionnaire, the backgrounds of the respondent and the firm were laid out in Part A and Part B. Somehow, it seemed that several respondents were not comfortable with completing the background part; hence, the questionnaire items relating to company resources and performance were replaced in Part A and Part B. Some respondents refused to respond to any items related to any kind of company or personal background. However, those items were retained as they form the profile of company differences. Later, an added number of questionnaires will be sent to a large sample for further analysis. Third, the questionnaire items for logistics resources are grouped together under one section so that respondents are comfortable completing the items relating to each item.

This research learned three lessons from the pilot survey. First, respondents in the logistics business were more responsive to completing the surveys when the research objectives were explained to them. Second, a personal contact prior to the survey request would increase the response rate due to respondents requesting it in their spare time and at their own convenience. Third, a personal visit ensured that the questionnaire was completed; otherwise it would not be completed until a reminder had been issued. Finally, they were more willing to respond if the survey was not disclosing information.

4.6 Data Analysis Techniques

Data collected from the survey are prepared for the subsequent analyses by completing several preliminary steps before testing the hypotheses. A factor analysis and reliability analysis aims to assess the validity of the measures. This is followed by descriptive statistics to describe the phenomena of interest. Correlations are calculated to identify any preliminary relationships among the latent (unobservable) variables examined.

Finally regression analyses will be conducted to test relationships and to determine the effects of the relationships among RBL and logistics performance.

4.6.1 Preliminary analysis

The initial step towards data analysis is preparing the survey data for subsequent analyses. Data preparations involving editing, coding, and data entry are necessary to transform raw data into a form appropriate for analysis. This is followed by tests to measure integrity in which an assessment of the construct validity of the scale is performed to ascertain that the scale has fully and unambiguously captured the underlying and unobservable construct it intended to measure. Further, an assessment of content validity is performed to examine the thoroughness with which the domain of the construct is established and the adequacy of the scale items in terms of representing all facets of the domain.

4.6.2 Factor analysis

As this research is considered to be pioneering in general and, in particular, with respect to logistics research, the researcher is unable to specify both the number of constructs that exist within the data to be analyzed and which specific measure should be assigned to each of these constructs. Perceptual measures of the degree of resource-based logistics (RBL) and logistics performance are newly developed; therefore, exploratory factor analysis (EFA) is performed. EFA helps to understand the structure of a set of variables (latent variables) (Field, 2009) and to reduce the possible data while retaining as much original information as possible (Field, 2009).

In this research all of the following are factor analyzed to extract the underlying information about their content and construct validity. This list includes the 30 items to measure the RBL variables and the nine items developed from the literature review plus the interviews to measure logistics performance. Factor analysis is a statistical technique which enables a determination of the natural clusters of items (variables that measure similar things) from a large correlation matrix which is expressed as dimensions or factors (Field, 2009) of the component of RBL and performance.

This research followed the initial steps necessary prior to computing factor analysis for all variables to ensure the critical assumptions in the factor analysis were satisfied (Hair et al., 1998). This was done as follows:

1) Looking for a desired multi co-linearity to indentify interrelated sets of variables. It causes problems to determine the unique contribution to a factor of the variables that are highly correlated (applied to both cases: factor analysis and regression)
    a. The correlation matrix scans for low correlations ($r < 0.3$) as well as high correlation ($r > 0.9$). It is important to avoid variables that are very highly correlated (extreme multi co-linearity) and variables that are perfectly correlated.
    b. There is no severe multi co-linearity in the data if the correlation coefficient values are less than 0.9 (Field, 2009) or below 0.8 as the cut-off point recommended by Hutcheson and Sofroniou (1999).
    c. If all questions in this research correlate reasonably well with all others and none of the correlation co-efficient is excessively large, the researcher should not eliminate any questions at this stage.
2) Ensuring that the data matrix had sufficient correlations as indicated by anti-image correlation. It is important to study anti-image correlation in detail as it is extremely informative.
    a. The KMO values for individual variables are produced on the diagonal of the anti-image correlation matrix.
    b. The value should be above the bare minimum of 0.5 for all variables. This research will exclude the item if the value is below 0.5.
    c. If the study data are above 0.5, then they have sufficient correlation as indicated by anti-image.

3) Examining the entire (population) correlation matrix through the Bartlett test of sphericity. Bartlett's test indicates whether the population correlation matrix is significantly different from an identity matrix (not an identity matrix). If it is significantly different, then overall there is some correlation between variables (there are clusters to find) which should be included in the analysis (Barlett, 1954).

a. For the factor analysis to be considered appropriate Barlett's test of Sphericity should be significant ($p < 0.05$) to indicate that correlations between items are sufficiently large for factor analysis (Tabachnik and Fidell, 2007).
b. Bartlett's test is highly significant if $p < 0.0001$

4) Quantifying the degree of inter-correlations among variables through the measure of sampling adequacy (MSA). Any significant test depends on sample size. So the reliability of factor analysis is dependent on sample size and much has been done to highlight the necessary sample size for factor analysis (Field, 2009). For example, a minimum sample size of 300 cases is recommended as a good sample size, 100 as poor and 1000 as excellent for factor analysis (Field, 2009).
    a. It is recommended to use the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) (Kaiser, 1974; Field, 2009) to determine whether this study sample size is adequate for factor analysis.
    b. The KMO index ranges from 0 to 1 with 0.6 suggested as the minimum value for a good factor analysis (Tabachnik and Fidell, 2007).
    c. The values between 0.5 and 0.7 are mediocre, values between 0.7 and 0.8 are good, values between 0.8 and 0.9 are great and values above 0.9 are superb (Hutcheson and Sofroniou, 1999).

The 30-item instrument within the independent variables is first analyzed using the exploratory factor analysis procedure where there is no restriction on data. This is a necessary initial step as there is, as yet, no available body of relevant theory to be used as a guide, apart from split studies on individual RBL components that were conducted independently. The preliminary analysis concerns data screening, assumption testing and sampling adequacy.

<u>Factor extraction</u>

Since this is the first analysis, exploratory factor analysis with varimax rotation should be selected to simplify the interpretation of factors (Field, 2009). The initial solution is extracted using the principal component method to extract sequential factors which are then rotated and factor loaded to enhance their interpretability by reducing the large set of variables into a more manageable set of scales. Rotational strategy is used to obtain a clear pattern of loading. The exploratory factor analysis with varimax rotation is performed to identify the factors for measuring tangible resources, intangible resources and logistics performance.

Number of factor

The number of factors to be retained might be based on the scree plots of data or the eigenvalue greater than 1. The cut-off point for selecting factors should be at the point of inflexion of this curve (where the slope of the line changes dramatically) (Cattell, 1966). The eigenvalues represent the amount of variation explained by a factor (variances extracted by the factor). An eigenvalue of 1 represents a substantial amount of variation (Kaiser, 1960; Field, 2009). This research used Kaiser's criterion which retains all factors with eigenvalues greater than 1.

Factor loading

The factor solution is considered stable if the items meet with these criteria. The significant item loading is above 0.3 (Hair et al., 1998; 2010). The researcher will delete items that show loading of less than 0.3 and items whose loading are greater than 0.3 on two or more factors (cross loading). Again the significant factor loading will depend on the sample size. Stevens (2002) recommended the following sample size for the significant factor loading (Table 4.8):

Table 4.8: Significant factor loading and sample size

Sample size	Significant factor loading
50	0.722
100	> 0.512
200	>0.364
300	>0.298
600	>0.21
1000	>0.162

The next step is to look at the content of questions that load onto the same factor to identify common themes which are meaningful to logistics resources and performance. Highly loaded questions can help the researcher to identify what the construct might be.

4.6.3 Scale reliability analysis

The reliability analysis of a measurement instrument determines the consistency with which the instrument measures the concept (Nunnally, 1978). The internal consistency method which is the most basic form of reliability estimation is considered to be most practical since it needs only one administration of a single measuring instrument. In this research, reliability is operationalized as internal consistency, which is the degree of inter-correlation among items which measure the same concept (Hair et al., 2010; Field, 2010).

Cronbach's alpha is considered to be a perfectly adequate indication of internal consistency and thus, of its reliability. The recommended measure of the internal consistency of a set of items is provided by the Cronbach's coefficient alpha (Churchill, 1979; Nunnally, 1978; Sekaran, 2003). The threshold level of Cronbach's coefficient alpha varies with the type of research; where new, exploratory-type researches could have a lower level of 0.60 (Nunnally, 1978) although the generally accepted lower limit is 0.70. This research adopted a threshold level of 0.60.

This step is followed by the descriptive statistics.

4.6.4 Descriptive analysis

<u>No significant difference</u>

This test is to achieve a greater understanding of the phenomenon independently. This is to ascertain the extent to which each construct is independent of other constructs. This is done by looking at an overall sample descriptive on 39 items as well as a test of the demographic differences of the LSPs.

The independent t-test is used to compare an independent and a dependent variable across two groups. Where the number of groups is three or more, the analysis of variance (ANOVA) is used (Hair et al., 1998). In this case, ANOVA is used on the size of the firm. The recommended measure for equal variance is determined by the cut-off 0.05 on Levene's test for equality of variances. Additional evaluation for ANOVA made use of the F-ratio, where a large F ratio indicated that there is more variability between the groups than there is within each group. To ascertain which of the groups differ, post-hoc tests are conducted.

Non-response bias

Any survey has to be concerned with non-response bias. Non-response bias refers to a situation in which people who do not return a questionnaire have opinions that are systematically different from the opinions of those who return their surveys.

To confirm that the respondents were a representative of general population, non response bias was assessed based on the notion that 'late respondents' would be more likely to be representative of non-responding LSPs (Armstrong and Overton, 1977). In this research those who agree to the questionnaire at the second or later call are a sample of non-respondents LSPs (to the first call) and the researcher assumes that they are representative of late respondents.

Hence the test for non-response bias is to compare the respondents of those who agree to the survey questionnaire at the first call (early respondents) to those who agree at the second or later call (late respondents). To compare the mean of these two different groups independent-sample t-test is performed comprising 39 items of logistics resources and performance measures.

4.6.5 Correlation analysis

This type of preliminary analysis is performed in order to determine the strength and direction of the bivariate relationships between variables. A correlation matrix using the Pearson product-moment coefficient is constructed to show these relationships. Spearman's correlation coefficient is a non-parametric statistic which can be used if the study data have violated parametric assumptions (non-normally distributed).

Each dimension within the respective components of resource-based logistics is then used to construct inter-correlation matrices among the variables. Further, the study data is also checked on the presence of multi co-linearity. According to Pallant (2007) and Hair et al., (2006) multi co-linearity exists when the independent variables are highly correlated ($r > 0.9$).

4.6.6 Regression

As indicated by theoretical framework, this research involves the relationship between two dependent variables which are customer service innovation and cost leadership and five independent variables, namely, technology resource, physical resource, relational resource, organizational resource, and management expertise resource. The regression analysis is used in this research for three main reasons. First, it is to test the relationship between each independent variable and two dependent variables. Second, it is to examine the impact of independent variables on both dependent variables. Finally regression analysis is used to justify the mediating effects.

<u>Simple regression analysis</u>

The first set of hypotheses in the theoretical framework (H1 - H5) is intended to test the relationship between each RBL and the LSP's logistics performance by conducting a simple regression analysis. It is a way of predicting the values of one variable and another. The researcher assessed the contribution of each RBL on two performance measures: customer service innovative and cost leadership by determining the significance of the F-statistics (p-value = 0.01) with the R^2.

i. The R^2 tells that each RBL can explain for a percentage of the variation in logistics performance. R^2 indicates the explanatory power for this research model. The simple linear regression is conducted to examine how much each RBL can explain logistics performances.
ii. The regression model is supported as indicated by the highly significant F-values. If it is significant at 0.01, F-statistics tell that the regression model overall predicts logistics performance.
iii. The unstandardized coefficients are used for the beta value of logistics resources since this study have the same scale for all those different variables. If it is significant at 0.01 the Beta value of logistics resource indicates the amount of contribution needed to explain the dependent variable (logistics performance) (Field, 2009). Meanwhile the standardized coefficients (Beta value) mean that the values for each of the different variables have been converted to the same scale.

<u>Multiple regression analysis</u>

The second set of hypotheses is applied to determine whether RBL components, when bundled, would be able to explain any additional variance in performance more satisfactorily than they would if acting on their own. The RBL component is assessed to determine its ability to add to the prediction of logistics performance measures and to see which RBL components contribute to explaining the variance. The stepwise regression is used for exploratory model building (Field, 2009) to determine which predictors are entered into the model (Miller and Ross, 2003; Panayides, 2004; Huang et al., 2006).

Stepwise regression is used to examine the statistical significant of models showing the relationships of variables as presented in the theoretical framework (Chapter Three). This analysis enables us to predict variability in the dependent variable based on its covariance with all the independent variables. Stepwise regression has been used to test the hypotheses for resource bundled or bundling effects of logistics resources on two logistics performances. This is to test how well all five RBLs predict performances. The Stein's formula is used to cross-validate a regression model where n is the number of samples and k is the number of predictors in the model (Stevens, 2002).

$$adjusted\ R^2 = 1 - \left[\left(\frac{n-1}{n-k-1}\right)\left(\frac{n-2}{n-k-2}\right)\left(\frac{n+1}{n}\right)\right](1-R^2)$$

If the calculated value is very similar to the observed value of R^2 then the cross validity of this model is very good.

Sample size is important in order to obtain a reliable regression model. The sample size that is required to achieve a high level of power is determined by the number of predictors and the size of expected effect. It is recommended that if the researcher is expecting a medium effect then a sample size of 200 will always be sufficient (up to 20 predictors) (Miles and Shevlin, 2001). Meanwhile Green's (1991) rule of thumb is based on a minimum sample size of 104 + k (number of predictor).

This research conducts preliminary analyses to ensure that there are no violations of the assumptions of normality, linearity, multi co-linearity and homoscedasticity.

<u>Multi co-linearity</u>

i. Previously it has been scanned in the correlation matrix of all predictor variables. The presence of high correlations is the first indication of substantial co-linearity. There was lack of high correlation but it does not ensure a lack of co-linearity. Co-linearity may be due to the combined effect of two or more other independent variables. Therefore, the two most common measures for assessing both pair wise and multiple variable co-linearity in the data are tolerance and its inverse, the variance inflation factor (VIF).

ii. The VIF indicates whether a predictor has a strong linear regression with the other predictor(s). The assumption of no multi co-linearity if the VIF value follows the suggested value for the good VIF which is not greater than 10 and the average (sum of VIP divided by number of predictors) is not greater than 1 (Myers 1990; Bowerman and O'Connell, 1990). The tolerance (1/VIP) for each predictor should not be less than 0.1.

iii. The multi co-linearity seems to be non-existent since the tolerance and variance inflation factor (VIF) statistics have met the criteria. The VIF values ranged from 1.88 to 2.82 (<10) and supported by tolerance values ranged from 0.36 to 0.59 (>0.10) indicating no possibility of multi co-linearity among independent variables.

iv. Durbin-Watson test statistics test the assumption of independent errors (lack of autocorrelation). The size depends upon the number of predictors in the model and the number of observations. As a rule of thumb the value of the Durbin-Watson test should be greater than 1 and less than 3.

Normality

i. All variables in this research are tested for the univariate normality of the distribution using Kolmogorov-Smirov test. The tests demonstrated normal distribution (0.03 to 0.6, p<0.01). The normality of the distribution is also tested and supported by the low skewness and kurtosis statistics and the examination of histograms with super-imposed normal curve.

i. The threat of heteroscedasticity is checked by examining the residual plot of the actual standardized residual values of the dependent variable against the predicted residual values. The scatter plot of the standard residual will show the graph of the data which display the points as randomly and evenly dispersed throughout the plot. This indicates the assumption of linearity and homoscedasticity have been met. The residual is a roughly rectangular distribution, with most scores concentrated in the centre of 0 point which are displayed in the scatter plot of less than 3.3 or more than – 3.3 (Tabachnick and Fidell, 2007). The presence of outlier cases can be detected if a standardized residual is not within this limit.

ii. To test the normality of residual, the histogram and normal probability plot is performed. The histogram should look like a normal distribution. The normal probability plot of regression standardized residual will show a normal distributed data set if all points lie on the line.

iii. The variation in logistics performance (R-square) for logistics resource bundles is acceptable in between 10% to 40% which are suggested as a good value from strategy literature (Ray et al., 2004) and logistics literature (Lai et al., 2008). This implies that logistics resources and capabilities are able to explain in between 10% to 40% of logistics performance in term customer service innovation and cost leadership.

iv. In the context of this research, the reason for low R-square is that logistics performance depends on a variety of factors which are not examined in this research. For example despite of resources and capabilities, other factors such as marketing strategy and customer orientation may have impact on logistics performance in term of customer service innovation and cost leadership.

<u>Series of regression analysis (hierarchical) on examining the moderator and mediator effects</u>

The post-hoc analysis is performed to further understand the bundling effect of logistics resource. The empirical results of the research demonstrate that those unique resources have affected the relationship between RBL components and performance (after stepwise analysis). The post-hoc analysis will partly answer RQ3 “How these logistics resources affecting the logistics performance of LSPs” and mainly answer RQ4 “How to manage these logistics resources to achieve high level of logistics performance”.”

According to Frazier et al. (2004), a moderator addresses “when”’ or “for whom” a predictor is more strongly related to outcome and a mediator addresses “how” and “why” unique resources cause performance. Thus the significant impact of unique RBL resources – i.e. technology, organizational and management expertise resources on logistics performance measures requires further justification by testing the moderating and mediating effects. Baron and Kenny (1986) suggest that a moderator is a variable that alters the direction or strength of the relationship between an independent and dependent variable. If a moderator does affect the relationship then there is an interaction between a predictor and mediator (Figure 4.1).

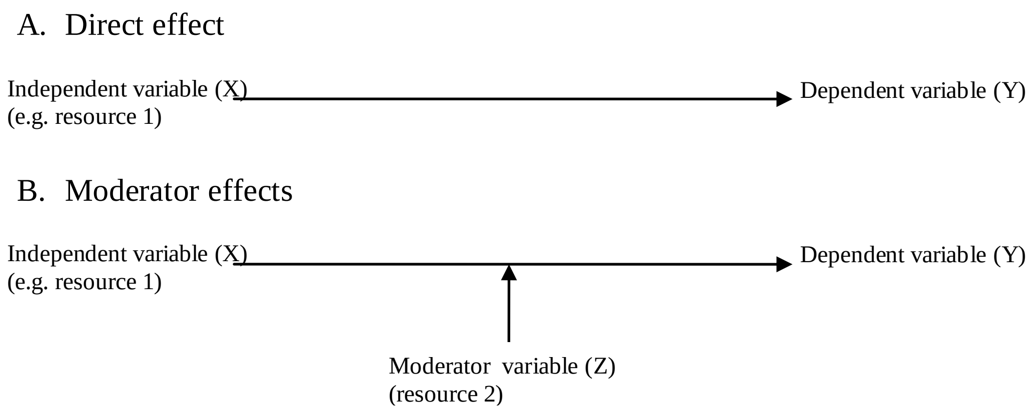


Figure 4.1: Diagram of paths in moderation models

The preliminary analysis is performed to investigate the interaction between each pair of resources and will conclude no moderation effects when the significant of the interaction effect is lower than p = 0.01.

Another investigation is performed on the mediation effects. The first step involves the main effect of the independent variable on the dependent variable (see path c in Figure 4A). The second step involves treating the mediator as if it were the dependent variable to show that the independent variable is related to the mediator (see path a in Figure 4B). The third step involves establishing the effect of the mediator on the dependent variable by controlling the effect of the independent variable (it seems sensible to control for independent variable to indicate the occurrence of complete mediation). This is to show that the mediator is related to the dependent variable (see path b in Figure 4B). The final step involves studying complete mediation which occurs in cases where the independent variable no longer has an effect on the dependent after the mediator has been controlled (compare Path c in Figure 4A with Path c' in Figure 4B).

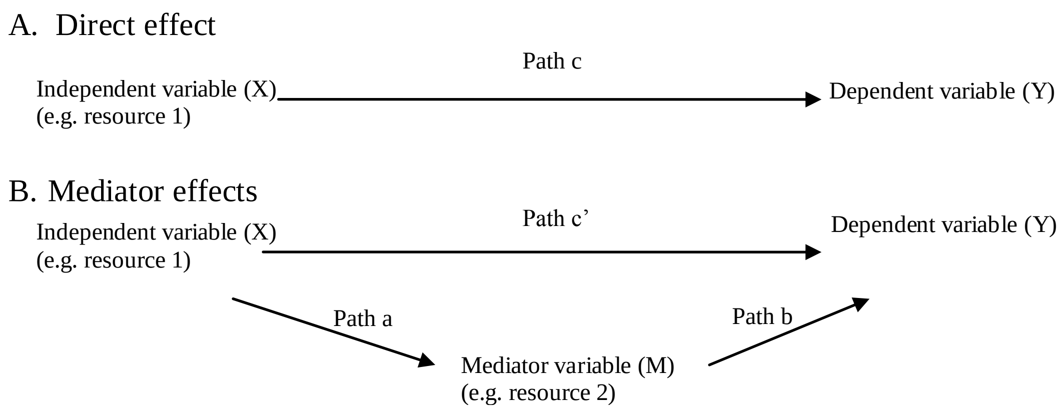


Figure 4.2: Diagram of paths in mediation models

Full mediation model implies that no direct effect exists between independent variables and performance (Rosenzweigs et.al, 2003; Frazier et al., 2004; Silveira and Arkader, 2007). Whereby if the first three steps are met but step 4 is not, then partial mediation is indicated – where the effects of the independent variable are both direct and indirect through the mediator (Rosenzweigs et.al, 2003; Frazier et al., 2004). This shows that if resource 2 is a partial mediator, the relationship between resources 1 and dependent variable will be significantly smaller when resource 2 is included.

To investigate the mediation effects a series of regression analyses are performed. To establish the mediation, the following series of regressions and steps must be followed (Baron and Kenny 1986):

i) The independent variable significantly affects the mediator
ii) The independent variable significantly affects the dependent variable in the absence of the mediator
iii) The mediator has significant unique effects on the dependent variable

The two criteria are used to judge whether or not mediation is occurring or not. The first criterion is to identify the mediation effects informally. If the first three steps are met then partial mediation is indicated. If the effect of the independent variable on the dependent variable are zero or shrinks upon the addition of the mediator to the model then full mediation is indicated.

The second criterion is to assess the mediation effects formally by using a statistical based method (MacKinnon and Dwyer, 1993; MacKinnon et al., 1995); the test used to test whether a mediator carries the influence of an independent to a dependent variable. This is to test the indirect effect of the independent variable on the dependent variable through the mediator is significantly different from zero (Sobel, 1982; Preacher and Hayes, 2004). The interactive calculation tool for mediation test named Calculation for the Sobel test (Preacher, 2010) (http://people.ku.edu/~preacher/sobel/sobel.htm) will be used to calculate z-score (value).
Z-value $= a*b$/Square root of $(b^2*s_a^2 + a^2*s_b^2)$ where a and b are un-standardized regression coefficients and s_a and s_b are their standard error for respective path. If $z > 1.96$ ($p<0.05$) the mediation effect is significant.

4.7 Summary

This research aims to examine resource-based logistics and determine its impact on logistics performance. The research views the phenomena as objective reality where knowledge is gained from sense data. This research is explorative in nature and it is appropriate to develop constructs and measurement scales for logistics resources (RQ1) and logistics performances (RQ2) by using the literature on strategy and logistics and interviews. The existing literature and interviews are the most suitable means to develop a theoretical framework for a research process that is both inductive and deductive. Developing a theoretical framework and proposing hypotheses is an appropriate way to achieve research objective 3 and to provide answers to research questions RQ2 and RQ3. The quantitative approach is the most appropriate means to answer these research questions by using survey and large samples. The factor analysis is conducted to factor RBL and logistics performances. Further, the relationship between RBL and logistics performance (RQ2 and RQ3) is examined by regression analyses (simple, stepwise). The post-hoc analysis is an appropriate approach with which to understand the bundling effects of RBL and how to manage these logistics resources to achieve a high level of logistics performance which designed to answer RQ4.

CHAPTER 5: INTERVIEWS FINDINGS

5.1 Introduction

This chapter discusses the data gathered from interviews that were conducted between February and March 2009. The interviews were conducted with informants purposely selected to answer research question RQ1 and RQ2, to support the conceptual framework, to support questionnaire development and to confirm survey findings.

The semi-structured interviews were conducted with logistics managers of logistics companies which were selected from the listing company in the Malaysia Logistics Directory (www.msialogistics.com). The purpose of these interviews with logistics managers was to answer issues concerning such questions as "what are logistics resources (RQ1)" and "what are the LSPs' logistics performances (RQ2)". The interviews were attempted in order to obtain feedback on what kinds of resources were acquired by logistics providers to run their logistics operations.

5.2 Company Profile

Overall the companies that were interviewed comprised four local companies, two foreign companies and one a joint venture company. All of which have been operating for a number of years: ranging from 3 years to 26 years, with growth variability from 7 percent to 20 percent as summarized in Table 5.1.

Table 5.1: Summary of company and informant profile

Company Case	Main Business	Informant
Company A Ownership: Local Business Operations: 25 years No of employee: 45 Growth: 7%	Container services and shipping	Position: Manager Gender: Male Experience: 8 years Education: Degree
Company B Ownership: Local Business Operation: 7 years No of employee: 10 Growth: < 10%	Transportation/ delivery and warehousing	Position: Director Gender: Male Experience: 20 years Education: High School
Company C Ownership: Foreign Business Operation: 10 years No of employees: 165 Growth: 20%	Air/sea cargo, container service, freight forwarders, transportation, warehousing and shipping	Position: Assistant Manager (Operations) Gender: Male Experience: 9 years Education: Diploma Position: Assistant Manager (customer service)

		Gender: Male Experience: 13 years Education: Diploma
Company D Ownership: Local Business Operation: 17 years No of employees: 89 Growth: 10%	Main Business: Air/sea cargo, container service, freight forwarders, transportation, warehousing	Position: Senior Executive Gender: Male Experience: 17 years Education: High School
Company E Ownership: Foreign Business Operation: > 10 years No of employees: less than 10 Growth: 10%	Air/sea cargo, container service, freight forwarders, shipping	Position: Manager Gender: Female Experience: 17 years Education: High School
Company F Ownership: Local Business Operation: > 3 years No of employees: 7 Growth: 7%	Air/sea cargo, container service, freight forwarders, transportation, warehousing and shipping	Position: Director Gender: Male Experience: 18 years Education: Degree
Company G Ownership: Joint venture Business Operation: 26 years No of employees: 180 Growth: 20%	Air/sea cargo, freight forwarders, transportation, warehousing and shipping, custom brokerage	Position: Senior Manager Air Freight Gender: Male Experience: 28 years Education: Diploma

Company A

Established in 1984, Company A is a local logistics company. Company A has been recognized as a logistics provider of containers and shipping. They have been constantly investing in new technology and human resources in order to remain competitive in such a demanding sector. They currently employ 45 full time employees. The company mainly handles vessels, shipping operations, containers, port operations, container repairs, haulage operations, customs clearance, warehousing and cargoes and shipments projects. They service logistics activities from Malaysia to neighbouring countries.

Company B

Company B has been providing local custom clearance, transportation and warehousing since 2002. It has been growing its business year on year in order to become a total logistics provider in Malaysia. The company currently has 10 full time employees. Since 2005 they have used the EDI system as this is important to their operation. Currently they own two trucks and they lease some warehouses, later they would like to own and buy more trucks. The researcher had the opportunity to interview the managing director and the senior manager of the company: Mr. B and Mr. BB respectively.

Company C

Established in 1999, Company C is recognized by customers for its superior supply chain management processes. This foreign company is a leading global logistics company (one of the top five companies in supply chain management) which currently has 165 full time employees located at the Cargo Complex, Penang, Malaysia. With more than 50,000 professionals at more than 1,000 locations in more than 100 countries around the world they provide end-to-end design, implementation and operation of logistics solutions in contract logistics, freight forwarding, distribution management and transportation management for large and medium-sized national and multinational companies. Currently they are inviting high calibre individuals to be part of their team. The researcher has interviewed two assistant managers: Mr. C and Mr. CC.

Company D

Formed in 2001, Company D is located in Penang, Malaysia. Company D is a subsidiary of its parent company and is recognized as the provider of best-in-class maritime transportation and logistics services. As a one-stop service provider, the company integrates a number of logistics services. These services include ocean freighting, distribution, freight forwarding, warehousing, etc in order to offer clients customized solutions that are designed to meet local, regional as well as global requirements. As an asset-based logistics service provider, Company D offers ocean freighting services with global network coverage. They are an asset-based company as well as an IT support system for purposes of enhancing global logistics networks. Currently, they have 89 full time employees.

Company E

Company E was founded in 1992 and its office in Malaysia was formed 10 years ago. The company currently has less than 10 full time employees. It is one of the present market leaders for Asian and European routes. It is managed by a team of experienced and reliable professionals. Today the activities of the company include sea and airfreight services, container services and shipping. As a foreign company operating in Malaysia, Company E is maintaining its numbers of key customers by ensuring good relationships between their customers and their suppliers. Most of their delivery destinations are the Middle East, Europe, India, Vietnam, Hong Kong, China and Taiwan.

Company F

Company F was established in 2005. Since then it has been operating its logistics business in air/sea cargo, container services, freight forwarders, delivery, warehousing and shipping. As a new local company they can only afford to employ four full time and three part time employees. By having contacts and a network, they established a good rapport with clients and always attend to their premises. Since they are new to the logistics business they are looking forward to having people with a good command of English for their overseas business. The researcher interviewed the Managing Director of Company F: Mr F.

Company G

Founded in 1983, Company G is a joint venture company. It is a global company with more than 34,000 employees and over 550 offices in 120 countries around the world. With annual revenue of over $7billion the company provides a comprehensive network of warehousing facilities, and transportation and freight management services world-wide. They address mainly local needs with access to local experts in more than 100 locations worldwide. Therefore the company has been providing real-time visibility to their supply chain. The researcher was able to interview the Air Freight Manager: Mr. G.

5.3 Results

The following presents the interview findings from research exploring the kinds of resources acquired by LPSs for logistics operations. These findings were acquired to ascertain what resources can enhance logistics performance.

5.3.1 Resources acquired

Somehow most LSPs emphasized their relational and technology resources, followed by physical resources, management expertise resources, and organizational resources. From the interview data, the logistics resources required to run a logistics business are prescribed as resource-based logistics (RBL) for the assurance of excellence in LSPs' operations. Appendix B summarizes the resources acquired by seven companies: data were extracted from interview transcriptions (Transcript 1-7 will be provided upon request). Overall, the interview data provides information on the logistics resources acquired by LSPs. They are physical, technology, relational, organizational and management expertise resources.

<u>*Relational resource*</u>: Interviewees referred to ‘contact,’ ‘networking,’ and ‘contract’ when asked about relational resources. The content analyses show that most LSPs confirm the importance of relational resources for their logistics operations. Several respondents admit that their collaborative relationship with clients is adequately developed. They describe how relational resources encompass the relationships that exist with customers, carriers and vendors. For example

> *“Basically for logistics what you need is the ‘contact’. Once you’ve established these contacts then you can expand your logistics network (customers, carriers and vendors). The more contact you have the better the leverage you will have. Within these networks we build up the relationship. We give more businesses then they give us lower cost” (Mr C).*

These results are supported by respondents of Company E and F. They confirm that

> *“It is about more than five years we built up the ‘relationship.’ To build up the relationship with customers and suppliers, “what we do is be as close friends with our customers and suppliers...and the supplier provides the lowest shipping rate or transportations cost*” *(Mrs E).*

> *“In logistics business, ‘networking’ and ‘contact’ should be the priority….. It requires us to establish good rapport with clients and always attend our clients” (Mr F).*

Mr B said that coordination or collaboration starts from the early stages of a business and thus good communication is important to develop contacts and to share information with business partners. Company B confirms the importance of communication. The respondent, Mr B mentions that “*the most important thing is to have a good communication with clients”.* Further, as the respondent from Company G emphasizes,

> *“When it comes to business sense, first we must make appointment to see the customer, organize with customers (call our team and their team, sit together)*

and build our relationship. We must know them before we can start the business, only then will they give us the contact".

The respondent from company D admits that good communication skills and a prompt response to the customer are required to keep up performance and to ensure further contracts are awarded. Mr. G describes the purpose of relational centres in order to understand customer requirements (comply with standard operating procedure), information sharing (request for information) and new business contracts (awarded contract). For example

"*Basically we provide services to users who have been contracted for every two years. We have established these relationships so that we can understand their requirements" (Mr B).*

Then respondent, Mr. E, mentions that having a good relationship with their customers and suppliers has invited further extensions in contracts and this has led to their consistent growth. These results are consistent with findings by Wong and Karia (2009) who assert that collaborative relationships have ensured winning new contracts, securing long term contracts and continuity of contracts.

Technology resource: When asked about technology, all LSPs state that they acquired basic technology for communication, documentation transactions and transfer transactions with their customers, suppliers and bankers. Mr C admits that technology wise they are not yet comparable to other providers. He says that the company has at least a basic technology with internet and email to support their operations.

The respondent from Company E confirms that technology such as email and internet enhances their operations by being paperless when compared with previous years. One respondent from Company C claims that technology would speed up their operations due to the fact that it cut unnecessary work, time, and cost, and was paperless. He suggests that future changes would include developing the technology or the IT side. Thus, technology reduces the lead time in logistics activities. However companies are sometimes faced with their systems being down and so they have to submit manually.

Further Mr. G describes that LSPs must have a system that every player can communicate with from beginning to end. He says

> "W*e have to be more advanced because customers also keep changing their systems. So our systems have to talk to their systems. Cannot have one stand alone system where nobody knows about it. So our system has to link with airlines, with authority, such as proof of delivery after shipment, automatically when they key into the system, we can trigger from here and this information will be sent out to shippers and the customers"*

Thus, LSPs have to keep up with advanced technology as customers keep improving their systems and technology facilities. Further LSPs should acquire an appropriate system for integrating information which is compatible with every logistics player.

The respondents confirm that their companies have made some improvement in their systems. For example, since 2005 the EDI system has been employed to support their logistics operations (Company B, D, and G). Company A admit that technology and innovation tend to make shipping faster and more practical and it can cope with future demand and Company G will keep up with advanced systems since customers keep changing their systems. Overall, LSPs are tending towards improving and they are adopting technology that is designed for logistics systems improvement if it is important for their logistics operations.

Physical resource: From the content analysis, asset-based service providers (company A and company D) acquire facilities or specialized equipment with advanced technology to support logistics operations. For example

> "*We are assets-based (container yards 5-6 acres = 2000 TEU), warehousing (100, 000sq.feet) and haulage", (Mr D).*

Meanwhile asset-light service providers also stress the importance of advanced physical resources for their logistics operations. Some asset-light service providers (e.g. Company B, C, E, F and G) out-source, lease or contract with asset-based service providers in order to provide such services as transportation, containers and warehousing. For example

"For the operations we have two trucks and rent some warehouses from our vendors. In future we would like to buy more trucks and have our own warehouse" (Mr B).

"We don't have to own or to be assets-based. We have our own vendors. Therefore, for transportations we engage with external vendors. For the logistics operations, 70% of equipment requirement is a must but 30% of equipment is depending on situation" (Mr C).

"*I think there is no need to have our own; we can get a third party. We own means we leased 20 trucks for two years to control certain customers that are too sensitive, they want to see our logo there. We never own that truck" (Mr G).*

This finding confirms the arguments put forward by Lieb and Bentz (2005) and Das and Teng (2000) who contend that instead of owning physical resources, LSPs need to cooperate with other service providers. LSPs are inclined to look ahead for alternative transportation for delivery goods, improvement in facilities, advanced equipment, facilities and systems. For instance, Company A looks ahead for specialized equipment to enhance their operations and their rail activities during the economic downturn. Company B intends to buy more trucks in the future.

On the other hand Company E and F have ranked low level for physical resources as most of their physical resources are outsourced from local forwarding companies or they have their own suppliers for vehicles and IT facilities.

Management expertise: Management expertise is another key resource acquired by LSPs. The respondents described management expertise as encompassing a team of experienced or reliable professionals that are being hired or trained. More than half of LSPs (Company A, B, C, D and G) confirmed that they employ experienced staff from the same industry and most of their staff have been with them for 10 to 20 years. It is believed that experienced staff can handle logistics operations and make decisions based on customer requirements. Mr. G mentioned that

"*These staff, they have been working more than ten to twenty years with the company. When you are talking about one year staff and ten year staff their experiences are different. And you can see their correctness of handling of your invoicing and documentation, handling, security wise. Customers wouldn't hijack your business,your shipment*".

Mr. G said that people are critical assets for LSP operations. This is what LSPs can offer in a system in which everyone has the same relational and physical resources. Management expertise is imperfectly mobile as it is tacit knowledge and stickiness in the company that leads to competitive sustainability. LSPs are inclining towards recruiting workers with logistics skills and knowledge. This is confirmed by respondents

"I have 20 years experience with shipping company, forwarding and transport companies" (Mr B).

"*In logistics what is very important is not the degree but the experience. People do hire us because of how much experience we have, what we have done in the previous company; if they are not from the same industry, they could be multi-experienced workers"(Mr C).*

The interviews reveal that management expertise can be developed by providing training or attending courses designed to upgrade the skills of logistics workers or to prepare them for future demands and requirements. LSPs stress that people can be taught. For example

"*We can train workers for logistics operations if they don't have any experience, skill or knowledge" (Mr B).*

"We highly believe people can be taught, however we require people with good English language as we mostly interact with international people"(Mr F).

The interviews reveal that the training provided to staff included customs procedures, customs clearing, airline theory and basic courses such as the handling of dangerous goods, general cargoes or related courses which pertain to the day-to-day job. The respondent from Company B mentions that they sometimes send their people on logistics courses, logistics seminars and IT courses. Indeed he has a certificate in logistics and attended conferences on customs procedures. The respondent, Mr. A, mentions that he covers all shipping activities and terms, he stresses he is competent in

> *"Handling vessels, ship operations, containers, port operations, container repair, haulage operations, customs clearance, warehousing, project cargoes and shipments. Handling rail activities and trading with neighbouring countries. However study needs to encompass all shipping and logistics as well as its technologies to be able to cope with demand and future shipment."*

LSPs stress that top management has an important role in developing a team of experienced staff to manage their operations. Company C admit that their top management employ a lean management strategy such as looking for 'best of the best people'. Mr. C said that, the best people are trained to be tough and smart so they are able to perform every task they are given. Mr. C added that due to the economic downturn the company employed the lean strategy because they want to cut costs by employing less staff and they only want appropriate staff. This is to ensure low running costs and increased productivity. The concept of bringing in less people (good ones) to do more work has reduced their operational cost and increased sales. Despite their logistics skills, Company C and D stress the importance of managerial skills. For example,

> *"They train you to be good, give you more challenges to do better, help us to develop our self confidence, develop our characters to be tough" (Mr C).*

> *"With the purpose of minimizing the cost of manpower the company has trained employees to be a set of people with multitasking skills so that everyone knows to run each unit. Therefore, the company now is recognized as heavy with upper and middle managers later considered as management expertise–based and light with lower staff" (Mr D).*

These findings confirm the previous literature by (Prahalad and Hamel, 1990; Grant, 1996; Drew and Smith, 1998; Hunt, 2001; Ellinger et al., 2002; Panayides, 2007b) which asserts that the competence and knowledge of human capital is reflected in management expertise. The content analysis shows that management expertise has become a unique resource for LSPs: a resource which is hard to imitate and substitute as Mr G mentions

> *"What are our strengths, always I get that from customers they will ask me what makes you differ from the others Talk about what make you differ from the others... You talk about system; everybody have the system, you talk about your good relationship with airlines, everybody has that. They can commit, even better they say. You say one they can get ten. So everybody have the same. So I told them... I do have my staff; they are an asset for me. I don't have a high turnover of staff, I don't have a problem. These staff, they have been working more than ten to twenty years with the company"*

<u>*Organizational resource:*</u> The content analysis shows that organizational resource such as routines, procedures or practices is another important key resource in the logistics business. The respondents describe organizational resource as encompassing a commitment to meeting customer requirements, satisfaction or service solutions by constant interaction and also compliance with client requirements. All LSPs are committed to their customers and aim to fulfil their requirements as any single mistake will be a penalty to LSPs. According to Mr G "fulfilling all customer requirements is our commitment and it is part of the logistics business". He cites that each of clients has a unique set of requirements because "different customers have different types of handling needs in their business. For example, some customers may request special handling of certain products, like dangerous goods, or certain perishable goods".

Several LSPs confirm and support the above statement. For example

> *"We focus on customers; want the best for our customers. To be the best for our customers, we are more flexible with our customer's need as compared to others. If they have an urgent or last minute shipment they simply will go for us. We are able to meet their needs as compared to others"(*Mr C).
>
> "*For us they are always right" (Mr B).*

"We place a high emphasis on customer requirements and customer satisfaction. The customers have the bargaining power of services so we are supposed to cater customers' needs or provide them with a total solution service" (Mr D).

"We *provide 24 hours service to customers. Customers can text or email us at any time and place" (Mrs E).*

Despite being highly committed to meeting the requirements of their customers LSPs must comply with organizational routines, procedures or policies in order to find solutions to problems. This way, they can ensure customer satisfaction, thus winning new business or the award of contracts. Compliance with procedure also helps companies to secure long term contracts and it enables continuity of contracts. Company G must comply with SOP (Standard operating procedures) to ensure their operations always go well. They make sure that everyone involved understands the requirements of their customers because different customers request different types of handling for their businesses. For example, Company G also has a complete quality control system; procedures are in place for every operations process to ensure that everyone understands and follows every procedure. They must be compliant with ISO procedures before they take on any business because some customers RFQ (request for quotation) will require LSPs with ISO compliance. Other LSPs, for example, Company D, will comply with ISO 9001, 1400 (OSHA), 1800 (environmental) because they operate big warehouses and equipment. Some LSPs comply with related compliances if they are located in a sensitive zone which requires them to comply or their compliance is based on customer requirements.

Meanwhile, Company A has not discussed on organizational resources level, hence it has been identified 'not mentioned'. Since Company A has been operating more than 25 years, it is most likely that Company A have already established their certain level of organizational resources. Company F has been identified with low organizational resources because they just establish their company for about 3 years; and when asked about it the manager said that they just require a relationship to develop good rapport with clients and perhaps leading them to attend their clients according to their need in future.

5.3.2 *Resources characteristics and their performance*

The researcher analysed interview data in order to explore resource characteristics. Guided by the coding scheme (Chapter 4, Table 4.5) and resource characteristics analysis (Table 5.2) the data were categorized as low, medium and high level (for detailed data see Appendix B).

Table 5.2: Resource characteristics

Types of resources and their characteristics	Example from transcribing interviews
Physical resource: High - LSP has the ability to acquire logistics and IT infrastructure and improvement in facility/equipment/maintenances Medium - LSP remained its equipments and facilities Low - LSP has not discussed it at all.	Company A and D own and need specialized warehouses or container yards. Company B, C and G leased from vendors and Company E and F only out-sourced their physical resources.
Technology: High - LSP hires advance IT system and advanced equipments to enhance global network, Medium - LSP employs system which require for communication and EDI Low – LSP doesn't have EDI	All except Company G have technology for communications and transferring documents. Company G has acquired advanced technology such as GPS for truck systems
Management Expertise: High - LSP recruits, hires experienced, skill and professional people, Medium - LSP acquires some skills Low - LSP looks for training while needed or has little discussion about it	Company C, D and G are highly developed and hired experienced and professional people for their logistics operations.
Relational: High - LSP establishes relationship and commitment with clients or business partners Low - LSP has little or no discussion about it	All except Company A have good relationships with their clients
Organizational: High – LSP's ability to meet customer requirement by routines, policies and ways of doing things on its strategy or objective Medium: LSP somehow attempt to fulfil customer requirement, provide solution Low - LSP has little discussion about it.	Most companies attempted with customers' requirement but company D and G discussed about the quality standard, procedures or compliances

The comprehensive resource characteristics are presented in Table 5.3. The results of Table 5.3 are better explained in a graph presentation as depicted in Figure 5.1.

Table 5.3: Summary of resources acquired, characteristics and performance

Company	Resources Acquired	Level	Growth
A Local	Physical Technology Management Expertise Relational	High Medium Medium Low	7%

	Organizational	Low	
B Local	Physical Technology Management Expertise Relational Organizational	Medium Medium Low High Medium	Less than 10%
C Foreign	Physical Technology Management Expertise Relational Organizational	Medium Medium High High Medium	20%
D Local	Physical Technology Management Expertise Relational Organizational	High Medium High High High	10%
E Foreign	Physical Technology Management Expertise Relational Organizational	Low Medium Low High Medium	10%
F Local	Physical Technology Management Expertise Relational Organizational	Low Medium Low High Low	7%
G Joint	Physical Technology Management Expertise Relational Organizational	Medium High High High High	20%

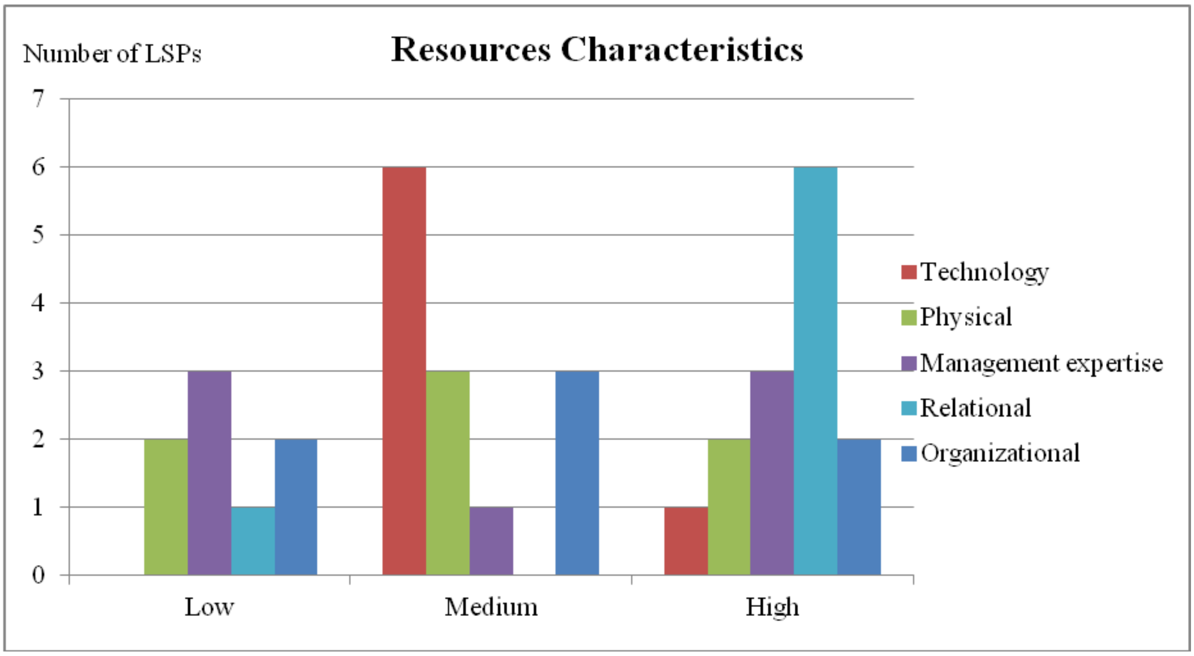


Figure 5.1: Graph of resources characteristics

From the interviews (summarized in Table 5.3 and presented in Figure 5.1), all of the seven LSPs have acquired medium to high levels of information communication technologies including email, internet, satellite-based tracking, and computerized EDI systems to support their interactions and transactions with customers. The medium levels of technology resources represent the LSP's ability to support company communication and information systems. Company G has the most highly advanced system. The company has an IT system for global networking (e.g. global positioning system, global information system). Regarding the LSPs A, B, C, D and G they have all acquired medium to high levels of physical resources such as warehouses, trucks, specialized equipment and new advanced equipment/facilities to deliver logistics services. The high levels of physical resources show that the LSPs are able to provide advanced physical equipment to support their operations. Six LSPs, B, C, D, E, F and G have acquired or built a rapport and relationship with clients and have developed communication skills to support negotiation and information sharing. Five LSPs, B, C, D, E and G have acquired or developed organizational resources such as organizational routines and procedures to comply with customer requirements and four LSPs, A, C, D and G have acquired a medium to high level of management expertise by hiring experienced, high calibre and skilled staff.

These composites form a resource-based logistics (RBL) which are heterogeneously distributed among the firms and are imperfectly mobile. Hence the strategic resources that form part of RBL are technology, physical, management expertise, relational and organizational.

The analysis of interviews (Table 5.3) also reveals two groups of LSPs. One group is those LSPs with medium to high resources and another group is those LSPs with low resources. Those LSPs with medium to high tangible resources (e.g. physical and technology) tend to acquire high intangible resources (e.g. management expertise, relational, and organizational) such as company D and G. Company D with high physical resources has trained its staff to multitask and equipped them with the skills to run logistics operations; and company G with high technology resources has inspired its staff to deliver service. Management expertise resources are crucial in order to utilize tangible resources (e.g. transportation and technology) and to execute and implement other intangible resources. The interviews reveal that intangible resources are crucial in order for LSPs to use tangible resources (transportation, warehouse and technology) efficiently. These interview findings are also supported by the literature on logistics which identify people as mostly involved in transportation and computer services (Lai et al., 2005), negotiations with clients, implementing strategy and creating and delivering services (Sander and Premus, 2005). The findings are also supported by the literature on strategy which states that intangible resources, such as human resources, can provide a sustained competitive advantage (Barney and Clark, 2009).

In contrast, for those LSPs which have not acquired high tangible resources, they tend towards low levels of management expertise and at most, medium levels of organizational resources, such as in companies B, E and F. But they do acquire high levels of relational resources with which to collaborate and coordinate with customers about their strategies and objectives. Here, relational resources are essential for those LSPs which have low to medium levels of technology and physical resources. Company B, E and F place a strong emphasis on building up a good rapport and relationship with clients and on developing communication skills in order to understand client requirements, and to support negotiation and information sharing. These companies also consider medium or low organizational resources to improve problems and to implement strategy. The interviews reveal that management expertise is not as highly emphasized when compared with LSPs which have acquired low levels of technology and physical resources. This is due to the fact that relational resources allow LSPs to make contacts and to network in order to gain new contracts or to ensure that contracts continue.

Based on the need to emphasize the higher ranking of certain acquired resources, the LSPs agree that relational and technology resources are important parts of resource-based logistics: followed by physical, organizational and management expertise resources. Those bundles of resources show that RBL is acting as a catalyst in recuperating the performance of LSPs. Therefore, the researcher requested LSPs to reveal the percentage of their company growth. The interview findings reveal three categories of revenue growth which include LSPs with 20% growth, 10% growth and less than 10% growth.

First, companies C and G have 20% growth and they have acquired high levels of intangible resources, specifically management expertise, relational and organizational resources. Second, companies D and E have achieved 10% growth and they have acquired at least medium levels of technology, relational and organizational resources. Finally, companies A, B and F have achieved less than 10% growth and not all have acquired intangible resources, but all have acquired medium level technology resources. The results reveal that company growth is a function of the RBL bundling demonstrated by LSPs. In general, LSPs with high RBL, had growth of 10% or more (Companies C, D, and G) whereas LSPs with medium to low RBL had growth of less than 10% (Company A, B and F). However, the interview findings were unable to reflect to asset-based companies since Company D acquired high RBL and yet it yielded a 10% growth.

The interview findings reveal which instruments are used by LSPs for their performance measurements. Respondents describe their performance measurement as varying from one unit to another, meaning that one provider has its own specific indicator, measurement or weighting. For example, Mr. C said that for customer service, the key performance indicator (KPI) is on time delivery and proof of delivery whereas Mr.CC said that for the operations unit the KPI is rather, on time, accuracy and zero corrections. All LSPs confirm that they have some specific measurement for financial and non financial performance (detailed data see Appendix C).

The performance measurements can be put into two categories: financial and non financial performance. Some companies use ‘revenue growth’ and ‘on time delivery’ (A, B and C); ‘loading and unloading duration’ (D); ‘maintain growth’ and ‘growth’ (E and F); and ‘100% update tracking’ (G) as financial performance measurement. Another non financial performance measurement is centred on customer service, service innovation and cost. Some companies focus on customer service to measure non financial performance such as ‘improving service and response to clients’; ‘maintain existing customers’ or ‘create new business’; ‘prompt response’; ‘meet customer requirements’ or ‘provide good service’; and ‘more service’. Some companies use service innovation to measure their performance such as ‘additional service’; ‘unique service’; ‘quick service’; and ‘just-in-time’; ‘competitive rate’; and some companies use cost to measure performance such as ‘reduce costs’; and ‘low operation costs’.

5.4 Summary

The interview findings provide the meaning of resource-based logistics (RBL) for all LSPs. The resources that were acquired to run logistics businesses are namely relational, basic technology, advanced physical, management expertise and organizational resources. All LSPs require some basic resources such as relational and technology resources and some acquire more resources which combine well with the existing resources (what they have already developed) such as physical, management expertise and organizational resources. The interview findings are widely supported by the logistics literature which identify technology and physical resources such as information systems, equipment and facilities (Lai, 2004; Stefansson, 2006), people (Skjoett-Larsen, 2000; Lai et al., 2005), relationship orientation (Panayides and So, 2005a) and organizational resources (Brah and Lim, 2006; Ellinger et al., 2008) as determinants of the performance of LSPs (Yang et al., 2009; Wong and Karia, 2010). This research finding confirms that LSPs acquired a bundle of tangible and intangible resources and provides empirical findings on the importance and impact of tangible and intangible resources on performance in logistics. The findings are supported by previous logistics literature which identifies tangible resources (e.g. plant, equipment, and raw materials distribution centre and logistics networks) and intangible resources (e.g. relationships, corporate culture, management skills, knowledge, logistics expertise, logistics services, and customer loyalty) (Mentzer et al., 2004).

Although research provides evidence for the influence of resource-based logistics on performance, the tangible and intangible resources acquired by LPSs are not fully encompassed. Several questions emerge concerning the impact of RBL on performance, how RBL affects performance and how RBL helps to achieve greater performance. These questions will be discussed in the Chapter Six.

CHAPTER 6: SURVEY DESCRIPTIVE STATISTICS AND FACTOR ANALYSIS

6.1 Introduction

This chapter presents the survey data and results of the statistical analyses. It begins with the results of the response rate, sample profile, resources acquired, characteristics and performance followed by the results of the preliminary analyses to ascertain the integrity of data; descriptive and correlation analysis and the LSPs trend.

6.2 Response Rate

Samples of LSPs are drawn from the Malaysia Logistics Directory (www.msialogistics.com) which is a comprehensive guide to the logistics industry in Malaysia. A list of 800 LSPs was compiled. The identified LSPs were contacted by telephone to explain the purpose of the research and to ascertain their willingness to participate. Using an initial sampling frame and three calls as the cut-off-point, 354 LSPs were reached and finally, 289 LSPs agreed to answer the survey.

The survey was carried out by a face-to-face meeting to ensure that the questionnaire was completed by the intended respondent. The respondents ranged from supervisors up to chief executives and all were in a position to report and control the resources and performance of their business. Then, by using a maximum of three calls to each company as the cut off point, the researcher managed to reach 125 managers of different LSPs giving a 35 percent response rate. Of these, two questionnaires were discarded due to incomplete or inappropriate data. The remaining 123 usable questionnaires provided a response rate of 34.7 percent. Therefore the 123 useable samples are acceptable for this research and good for subsequent data analysis (Barlett, 1954; Kaiser, 1974).

A response rate of 35 percent is achieved due to several factors. First, this survey allows the interviewer to make highly personal contact with the respondent, to explain the importance of the survey, and to answer any questions or concerns the respondent might have. Second, it allows the respondents to answer the surveys at their own convenience. Third, the respondents are not forced to fill in the questionnaire; rather their willingness was due to the fact that they were free to respond within the time period of the survey. Fourth, because of the time it takes to make personal contact with the respondents, the sample is considerably smaller than a mail survey sample. Finally, it is important to note that the variables identified in this research are gathered from literature reviews and initial interviews, both independent and dependent variables are considered as pioneering in logistics research.

6.2.1 Test for response and non-response bias

Any survey has to be concerned with non-response bias. Non-response bias refers to a situation in which people who do not return a questionnaire have opinions that are systematically different from the opinions of those who return their surveys.

The trend of data gathering for the research is presumed to follow a similar pattern. First, all respondents are reached by a systematic random sampling, with three calls as the cut off point. Second, the first respondent who agrees to be interviewed is assumed to be the first informant and the last respondent who agrees is assumed to be the last informant. Third, all survey interviews are undertaken at a location and time that is convenient for respondents. Finally, the objectives of the research are explained to all respondents. This means that this research counts the responses received as indicative of their willingness to respond within the period of the survey.

To confirm that the respondents are a representative sample of the general population, non response bias is assessed based on the notion that 'late respondents' would be more likely to be representative of non-responding LSPs (Armstrong and Overton, 1977). For this research, those who agree at the second or later call are a sample of non-respondents LSPs (to the first calling) and the researcher assumes that they are the representative of late respondents.

Hence the test for non-response bias is to compare the respondents who agree to the questionnaire at the first call (early respondents) to those who agree at the second or later call (late respondents). To compare the mean of these two different groups an independent-sample t-test is performed with 39 items of logistics resources and performance measures. Overall, no significant differences ($p>0.1$) regarding their perspectives on 39 items, were found between early and late respondents.

Furthermore comparisons between the early and late respondents in key constructs, including firm size (number of employee), firm status (ownership) and duration of business were conducted using a t-test. As a result, no significant differences were found between these two groups in terms of any of the three measures (for firm size: p=0.760, firm status: p=0.498, duration of business: p=0.435). Therefore, non-response bias was not expected to be a serious problem. A detailed description of the tests is shown in Appendix E.

6.3 Sample Profile

The screening and cleaning of survey data are important before analyzing the data. The researcher checked for errors while entering data and errors were found and corrected. Once the data was clean (no error in the data), the researcher began to explore the nature of the study variables for the purpose of normality and possible outliers.

6.3.1 Firm profile

The responses of 123 LSPs are analyzed and presented in Table 6.1 describing sample characteristics (firm background). All participants are from integrated logistics providers which provide full and integrated logistics provision (Africk and Calkins, 1994). Slightly over half (51 percent) of LSPs are fully Malaysian-owned companies against none Malaysian-owned (49 percent). Those fully foreign-owned firms are from Germany, United States, Japan, The Netherlands, Taiwan and Singapore. The firms are almost equally represented in terms of organization size, 24 percent of firms have less than 50 employees, 15 percent of firms have 50 to 100 employees, 20 percent of firms have 101 to 200 employees, 17 percent of firms have 201 to 500 employees, and 24 percent of firms have more than 500 employees.

Table 6.1: Company profile

Variables	Frequency	Valid %
Response rate		
Total selected	354	
Agreed to participate	289	
Actual participated	125	35.31
Useable responses	123	34.74
Ownership of the Company		
Local	61	51.3
Joint venture	29	24.4

Foreign Missing	29 4	24.4
Number of full time employees Less than 50 50 to 100 101 to 200 201 to 500 More than 500 Missing	 22 17 23 20 28 8	 24.0 15.0 20.0 17.0 24.0
Number of years LSP has been operating 15 years and less Above than 15 years Missing	 45 50 28	 47.0 53.0

N = 123

Slightly more than half (53 percent) of the LSPs have been in the industry for more than 15 years. Often this is a reflection of the stability of the logistics industry in Malaysia, with the average being 20 years and the standard deviation being 15 years.

6.3.2 Respondent Profile

Table 6.2 describes the respondent profiles. Out of the 121 respondents (two respondents not indicated), 38 percent of respondents are from a top management positions and 37 percent represent middle management, since they were called before the visits, while 25 percent are representative of either managers or assistants and they were not available during the visits. There are almost equal numbers of respondents in the educational qualifications category, 32 percent of managers have a high school education, and 32 percent of managers hold a diploma or certificate in logistics. 36 percent of managers hold degrees at master level and above. It can be seen here that generally the respondents are managers with a good education and training.

Table 6.2: Respondent profile

Variables	Frequency	Valid %
Position Top management Middle management Representative N = 121	 47 45 31	 38.0 37.0 25.0

Education Qualification High School Diploma/certificate Degree or above Missing N = 115	 38 38 42 5	 32.0 32.0 36.0
Years of being employed with firm Less than 3 years 3 to 5 years 6 to 10 years More than 10 years Missing N = 98	 11 34 27 26 25	 11.0 35.0 27.5 26.5
Years of being employed in the logistics industry Less than 3 years 3 to 5 years 6 to 10 years More than 10 years Missing N = 73	 20 17 12 24 9	 27.4 23.2 16.4 33.0

At 54 percent more than half of the respondents are medium or long term employees with the company and assumed to be very experienced in the logistics services industry; 33 percent have been in the same industry for more than 10 years. It can be generalized here that the respondents are people with medium or long term experience in this nature of business and even when they changed jobs they remained in the same industry. The results show that LSPs have people who are well-educated, trained and experienced in logistics industry.

6.3.3 Resources profile (Section C)

The questions in Section C are intended to ascertain the specific background of the company resources profile. This section asks about the extent of resources acquired by LSPs, and the impact of resources and logistics performance measurements. The purpose of section C is to validate the consistency of respondents' answers in sections A and B.

The respondents are asked about the general resources that are acquired by their firms. Table 6.3 shows the results for resources acquired by LSPs. About 90 percent of LSPs acquire high levels of such resources: equipment, facilities, technology, human resources (experienced and expert people), relational and organizational resources. They acquired very high levels of relational resources (50%) followed by facilities resources (47%) and technology resources (46%). About 52 percent of the LSPs acquired large numbers of professional workers.

Table 6.3: Resources profile (C6)

Resource	Category	Frequency $n = 123$	Valid %
1. Equipment	Slight extent	1	1.0
	Moderate	12	10.0
	Great extent	57	47.0
	Very great extent	51	42.0
	Missing	2	
2. Facility	Slight extent	2	2.0
	Moderate	10	8.0
	Great extent	53	43.0
	Very great extent	57	47.0
	Missing	1	
3. Technology	Slight extent	2	1.2
	Moderate	12	9.8
	Great extent	52	43.0
	Very great extent	56	46.0
	Missing	1	
4. Relational	Slight extent	1	0.8
	Moderate	14	11.2
	Great extent	46	38.0
	Very great extent	61	50.0
	Missing	1	
5. Organizational	Slight extent	3	2.0
	Moderate	11	9.0
	Great extent	56	46.0
	Very great extent	52	43.0
	Missing	1	
6. Experience worker	Slight extent	1	1.0
	Moderate	13	11.0
	Great extent	55	45.0
	Very great extent	53	43.0
	Missing	1	
7. Professional worker	Slight extent	2	2.0
	Moderate	18	15.0
	Great extent	64	52.0
	Very great extent	38	31.0
	Missing	1	

The mean and standard deviation of resources acquired are presented in Table 6.4. Responses to these resources are made on the 5-point Likert scale measure 0 = not at all, 1 = slight extent, 2 = moderate extent, 3 = great extent and 4 = very great extent. This research has decided that a mean score of 1.7 or less is considered as "low", mean scores between 1.71 and 2.99 are considered as "moderate" while mean scores of 3.00 or higher are assumed to be "high". Overall the mean scores for these resources have shown great variability, indicating that such resources are highly dispersed amongst LSPs at a mean above 3.1, standard deviation is above 0.7.

Results of mean scores imply that equipment, facilities, technology, experienced and professional workers, relational and organizational resources are high level acquisitions by LSPs. Relational (3.4), facility (3.4) and technology (3.3) resources are among the three highest level resource acquisitions among LSPs. However the above assumptions need further analyses.

Table 6.4: Mean and standard deviation of resource acquired (C6)

	N	Minimum	Maximum	Mean	Std. Deviation
Professional Workers	122	1	4	3.13	0.715
Organizational	122	1	4	3.29	0.733
Equipment	121	1	4	3.31	0.681
Experienced Workers	122	1	4	3.31	0.693
Technology Acquired	122	1	4	3.33	0.721
Facility	122	1	4	3.35	0.703
Relationship	122	1	4	3.37	0.718

6.3.3.1 Technology, physical and organizational resource

Section C8, C9 and C11 refers to the characteristics of logistics resources. The respondents were asked to judge resource characteristics based on the 5-point Likert scale: measure 0 = not at all, 1 = slight extent, 2 = moderate extent, 3 = great extent and 4 = very great extent. This research has decided a mean score of 1.7 or less is considered as "low", mean scores between 1.71 and 2.99 are considered as "moderate" while mean scores of 3.00 or higher are assumed to be "high".

The acquisitions of technology and equipment/facilities resources by LSPs are presented in Table 6.5 and Table 6.6. Email (4.0), Internet (3.6) and EDI (3.5) are the three most important IT/technology acquisitions by LSPs. However email technology shows the lowest dispersion at mean = 4.0, std. deviation = 0.54 compared to the other resources, while activity-based costing has a lower mean but also the highest dispersion (mean = 3.2, std. deviation = 0.91).

Table 6.5: Mean and standard deviation of technology/IT (C8)

	N	Minimum	Maximum	Mean	Std. Deviation
Enterprise resource planning	107	1	4	3.07	0.876
Activity-based costing	110	1	4	3.17	0.907
Electronic transfer transaction	116	1	4	3.25	0.853
Intranet	111	1	4	3.41	0.792
Bar-code	105	1	4	3.44	0.720
EDI	117	1	4	3.50	0.761
Internet	120	1	4	3.58	0.643
Email	121	2	4	3.71	0.539

Vehicles (3.6), warehousing (3.4) and container yards (3.3) are the three most important resource acquisitions for the equipment and facility resources. Consistent with technology resources, the highest dispersion shows a low mean, for example, rail (mean = 3.1, std. dev. = 1.1), as well as bases (mean = 3.1, std. dev. = 1.0).

Table 6.6: Mean and standard deviation of equipments and facilities (C9)

	N	Minimum	Maximum	Mean	Std. Deviation
Rail	92	1	4	3.08	1.082
Bases	97	1	4	3.08	0.997
Vessels	95	1	4	3.17	0.975
Hubs	103	1	4	3.21	0.956
Container Yard	97	1	4	3.27	0.860
Warehousing	116	1	4	3.43	0.836
Vehicles	111	1	4	3.57	0.655

Table 6.7 describes the organizational resource characteristics. For organizational resources the LSPs undertake the following procedures or practices. Customer focus (4.0), continual improvement (3.6) and quality management (3.6) are the most frequent practices by LSPs. Environmental policy shows the highest dispersion at mean = 3.3, std.dev = 0.7, while customer focus has the highest mean but a lower dispersion at mean = 3.8, std.dev = 0.4.

Table 6.7: Mean and standard deviation of organizational resource (C11)

	N	Minimum	Maximum	Mean	Std. Deviation
Policy on environment	116	2	4	3.30	0.713
Quality management	118	2	4	3.58	0.618
Continual improvement	117	2	4	3.60	0.573
Customer focus	117	2	4	3.84	0.393

For human resources the results of section of 6.3.2, the respondent profiles show that LSPs have acquired educated, trained and experienced people. The results from feedback on open-ended questions have shown that managers have skills and knowledge in logistics and supply chain management, shipping and customs clearance and management. This is followed by experience and training in transportation/delivery, air/sea freight, warehousing, forwarding, and cargo, as well as communication and customer services.

6.3.4 Performance profile

6.3.4.1 Financial performance

Based on the previous three years, the respondents were asked to indicate the percentage of growth and delivery; and the average length of contract (Table 6.8). There is almost a fair representation in the percentage of growth (less than 15% and 15% or above) as well as the percentage of on time delivery (90% or less and more than 90%).

More than half, roughly (58%) of the LSPs have growth of 15 percent or above and 48 percent of LSPs have a percentage rate of 90 percent for deliveries on time. There is greater variability in the mean level of growth with mean = 20%, std. dev. = 17% and the mean level of delivery with mean = 85%, std. dev. = 21%.

Table 6.8: LSPs financial performance

Variables	Frequency	Valid %
Growth		
Less than 15%	38	42.0
15% or above	53	58.0
Missing	32	
N=91, Mean = 20, Std. dev = 17		
On time delivery		
90% or less	50	52.0
More than 90%	46	48.0
Missing	27	
N=96, Mean = 85, Std. dev. = 21		
Average length of contract		
Less than 3 years	25	28.0
3 years to less than 5 years	29	33.0
5 years and above	34	39.0
Missing	35	
N=88, Mean = 4.5, Std. deviation = 3.3		

Another performance indicator is the LPSs length of contract. Firms are almost equally represented when it comes to length of contract. 39 percent of firms have contracts for five years or more, 33 percent of firms have contracts for three years to less than five years and 28 percent of firms have contracts for less than three years. The mean length of contract with LSPs business partners is about 4.5 years and the standard deviation is 3.3 years, indicating greater variability in the mean level of contract in the relationship with business partners.

6.3.4.2 Non financial performance

Table 6.9 describes the mean and standard deviation of logistics performance. When asked about which factors to measure for logistics performance, the respondents indicated delivery, quality, cost, flexibility and innovation. There is greater variability in the mean level of innovation in logistics performance (mean = 3.44, std. deviation = 0.65) against the other factors, while delivery has the highest mean but lowest dispersion at mean = 3.77, std. deviation = 0.50 as compared to the others factors.

Table 6.9: Mean and standard deviation of logistics performance (C10)

	N	Minimum	Maximum	Mean	Std. Deviation
Innovation C10e	117	2	4	3.44	0.648
Flexibility C10d	118	2	4	3.58	0.591
Cost C10a	120	1	4	3.62	0.636
Quality C10c	120	2	4	3.71	0.509
Delivery C10b	120	2	4	3.77	0.463

When asked about the resources that impact logistics performance, the respondents perceived the following resources to have a positive impact on logistics performance (Table 6.10). There is greater variability in the mean level of resources that impact on performance (mean above 3.4, std. deviation = 0.6). The result shows that technology (3.6), facility (3.5) and experienced workers (3.5) have the highest means, indicating that such resources have a significant positive impact on performance.

Table 6.10: Mean and standard deviation of resource that affect logistics performance

	N	Minimum	Maximum	Mean	Std. Deviation
Professional workers C7f	120	1	4	3.42	.694
Equipment C7a	120	1	4	3.43	.683
Organizational C7g	120	1	4	3.45	.684
Relationship C7d	120	1	4	3.47	.697
Experience workers C7e	120	2	4	3.52	.622
Facilities C7b	120	1	4	3.53	.648
IT/Technology C7c	120	1	4	3.58	.644

6.4 Descriptive Statistics

Each of the factors obtained from the preceding analyses are further tested to determine how one variable construct is independent of another variable. The results of various descriptive analyses are presented first, by looking at the differences in each item used for the variable construct, followed by a test for demographic differences and lastly, by examining the bivariate relationship between variables.

6.4.1 Mean and standard deviation of variables

Table 6.11 shows descriptive statistics for the items used. All the variables are measured on a 5-point Likert type scale (1 = strongly disagree to 5 = strongly agree). The mean scores are used to determine the level of agreement between the variables. This research decided that a mean score of 1.67 or less is considered as “low”, mean scores in between 1.68 to 3.34 are considered as “moderate”, while mean scores of 3.35 or higher are considered as “high” (Pallant, 2007).

The mean values of resource-based logistics are relatively high (3.7 to 4.4) and its standard deviation range between 0.63 and 1.02 indicates that high levels of resources are acquired by LSPs. Further, the logistics performance measures have mean values in the range of 3.6 to 4.0, which give an indicator that the logistics performance of the LSP samples is also high. The minimum value was 1 to 2 for most items followed by 3 for certain items and the maximum value was 5 for all the items.

Overall the standard deviation values for logistics resources (0.51 to .61) and logistics performances (0.60 to 0.76) are considered relatively high, indicating means values are highly dispersed among LSPs, implying the heterogeneity nature of logistics resources and performances as expected by the RBV theory. As such, these results imply that advanced physical, technological, organizational, relational, and management expertise resources are high level acquisitions for logistics service providers and also for logistics performance. However, these assumptions require further analyses.

Table 6.11: Mean and standard deviation of variables

Variables	Items	Statistics			
		Mean	SD	Min	Max
Advance physical resource	QA27 Look for new or technology advance equipments	3.98	0.776	1	5
	QA5 Acquire web-base information system	3.89	1.015	1	5
	QA21 Acquire advance equipment	4.01	0.639	2	5
	QA6 Acquire continual improvement in facility	4.15	0.713	2	5
	QA7 Acquire improvement in technology usage	3.97	0.792	2	5
Technology resource	QA17 Provide basic communication tool	4.40	0.712	2	5
	QA3 Provide software and computer system	4.17	0.786	1	5
	QA24 Provide frequent maintenances	4.13	0.682	3	5
	QA2 Provide computer facility/equipment	4.10	0.824	1	5
Organizational Resource	QA29 Ensure constant communication with business partner	4.21	0.633	3	5
	QA22 Focus on customer requirement	4.38	0.662	3	5
	QA25 Provide solution to customers	4.30	0.691	3	5
	QA28 Ensure informal interaction with business partners	3.96	0.743	2	5
	QA20 Able to achieve customer satisfaction	4.14	0.708	2	5
	QA19 Establish trust and commitment with business partners	4.18	0.645	2	5
Management Expertise Resource	QA11 Recruit experienced workers from the same industry	3.70	0.861	1	5
	QA4 Provide IT training to upgrade logistics workers	3.91	0.905	1	5
	QA1 Employ multi-experienced workers	4.00	0.782	1	5
	QA8 Recruit logistics professional executives	3.77	0.787	2	5
Relational Resource	QA10 Establish coordination/collaboration with business partner	3.94	0.716	1	5
	QA9 Commit to share information amongst business partners	3.79	0.822	2	5
	QA15 Require staff with good communication skill	4.23	0.736	3	5

Customer Service Innovation	QB8 Better services	4.07	0.697	2	5
	QB5 Greater percentage of on time and accurate delivery	4.00	0.704	2	5
	QB9 Quicker responses to customers	4.15	0.679	3	5
	QB6 More unique solution	3.92	0.745	2	5
	QB2 More satisfied with the service level	3.89	0.736	2	5
	QB3 More additional service	3.99	0.710	2	5
Cost	QB4 Lower equipment/facility cost	3.61	0.829	1	5
	QB1 Lower distribution cost	3.56	0.834	1	5

6.4.2 Test of differences by demographic (Appendix F & G))

To better understand the variations in firms, tests of differences are conducted. The mean and standard deviation for non-financial and financial performances are obtained based on the following: business duration, ownership status and firm size. The results are summarized in Tables 6.12. Overall there are no great or significant differences in the non financial and financial performance of LSPs across demographics.

Table 6.12: Test of differences of demographic variables on performance

Variables	Customer service innovation				Cost leadership			
	Mean	Std. Dev.	t	p	mean	Std. Dev.	t	P
Ownership Status Fully Malaysian-owned None fully Malaysian-owned	 3.96 4.06	 0.61 0.59	 -0.90	 .37	 3.44 3.79	 0.79 0.66	 -2.62	 0.01
Business duration 15 years or less Above 15 years	 4.01 4.11	 0.58 0.60	 -0.74	 .46	 3.83 3.38	 0.60 0.86	 2.96	 0.01
	F		p-value		F		p-value	
Firm size	2.27		0.07		1.18		0.33	

Variables	Growth				Delivery				Average of contract			
	mean	Std. Dev.	T	p	mean	Std. Dev.	t	P	mean	Std. dev.	T	p
Ownership Status Fully Malaysian-owned None fully Malaysian-owned	22.57 17.33	21.26 11.24	1.47	0.15	80.53 89.62	25.11 15.17	-2.14	**0.04**	4.32 4.58	3.71 2.97	-0.37	0.72
Business duration 15 years or less Above 15 years	20.95 20.30	19.30 16.72	0.16	0.87	83.08 85.86	24.48 20.79	-.055	0.58	4.08 4.47	3.58 2.94	-0.52	0.60
	F-value		P-value		F-value		p-value		F-value		P-value	
Firm size	0.52		0.72		1.35		0.26		1.79		0.14	

For financial performance, the mean and standard deviation (growth, delivery and contract) are obtained based on the following: business duration, ownership status and firm size are summarized in Table 6.12. Overall there is no significant difference for financial performance across demographics. However, those LSPs which are not fully Malaysian-owned have a slight difference in the mean for financial performance of delivery when compared with Malaysian-owned companies.

The tests of differences that are conducted for mean and standard deviation of resources are obtained based on the following: business duration, ownership status and firm size as summarized in Table 6.13 and the details are provided in Appendix G. Overall there are no significant differences in resources acquired across demographics at sig 0.01. However, those LSPs which are not fully Malaysian-owned LSPs have a slightly different mean of relational and management expertise.

Table 6.13: Test of differences of demographic variables on resources

Variables	Business Duration 15 years or less Above 15 years				Ownership Status Fully Malaysian-owned None fully Malaysian-owned			
	mean	Std. Dev.	t	p	mean	Std. Dev.	t	P
Physical	3.99 3.98	0.56 0.69	0.050	0.96	3.94 4.05	0.61 0.62	-0.88	0.38
Technology	4.19 4.25	0.54 0.56	-0.475	0.64	4.18 4.25	0.54 0.60	-0.65	0.52
Organizational	4.18 4.24	0.53 0.51	-0.613	0.54	4.18 4.23	0.55 0.48	-0.53	0.59
Relational	3.95 3.97	0.57 0.65	-0.20	0.84	3.87 4.10	0.59 0.58	-2.01	0.04
Management Expertise	3.90 3.73	0.54 0.66	1.42	0.16	3.73 4.00	0.58 0.64	-2.13	0.04

Results of test of differences (ANOVA) of firm size on resources

Firm size	physical	Technology	organizational	relational	Management expertise
F-value	1.91	0.39	0.92	1.58	1.39
p-value	0.11	0.81	0.46	0.18	0.24

6.5 Factor Analyses

6.5.1 Critical assumptions for factor analysis (Appendix H)

All KMO values for individual items were > 0.8, which is well above the acceptable limit of 0.5 (Field 2009). This indicates that there is sufficient inter-correlation among variables so this research data set is suitable for factor analysis (detailed data see appendix H). Bartlett's test of Sphericity Chi-Square = 1987.9, p< 0.001, indicating that correlations between items are sufficiently large for factor analysis. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for this analysis, KMO = 0.87 which is great (Hutcheson and Sofroniou, 1999). At this stage, no item is eliminated since all items correlate reasonably well with others; and none of the correlations coefficient is excessively large (0.90)

6.5.2 Factor analysis for tangible resources (Appendix I)

Exploratory factor analysis with varimax rotation was conducted on 10 items for tangible resource (detailed data see appendix I). Two components had eigen values over Kaiser's criterion of 1 and in combination explained 58.3 percent of the variance. The scree plot revealed a clear break (point of inflexion) after the two-factor solution. Thus, given the convergence of the scree plot and Kaiser's criterion on two components, these two components are retained in the final analysis. Table 6.14 shows the factor loadings after rotation. Items that cross-load with other factor would be considered if the factor-loading value was greater than 0.60. In this case, one item QA18 was dropped due to cross and low factor loading.

Table 6.14 reveals the results of factor analysis for tangible resources. The analysis concludes that there are two distinct factors which, together, accounted for approximately 58.3 percent of total variance. Factor 1 comprised five items, namely, new or advanced technology equipment, web-based information systems, advanced equipment, and improvement in logistics facility and technology usage, which accounted for 31.88 percent of total variance. Since most items are related to advanced technology, this factor was identified as technology resources. Factor 2 comprised four items, namely basic communications tools, software and computer systems, maintenance and logistics facilities and equipment, which accounted for 26.42 percent of the total variance. Since most items are related to basic facilities or infrastructure and technology, this factor is identified as physical resources.

The technology resources and physical resources achieved high reliabilities, with Cronbach's alpha 0.82 and 0.75 respectively (Appendix L).

Table 6.14: Factor analysis for tangible and physical resources

Tangible and physical resources	Factor 1	Factor 2
QA27 Look for new or technology advance equipments	**0.789**	0.122
QA5 Acquire web-base information system	**0.749**	0.148
QA21 Acquire advance equipment for logistics operations	**0.739**	0.158
QA6 Acquire improvement in logistics facility	0.**633**	0.475
QA7 Acquire improvement in technology usage	0.**627**	0.438
QA18 Use product identification and tracking system	0.547	0.444
QA17 Provide basic communication tool	(-)	**0.829**
QA3 Provide software and computer system	0.157	**0.686**
QA24 Provide frequent maintenances	0.420	0.**638**
QA2 Provide computer facility/equipment	0.404	**0.633**
Eigenvalue	3.19	2.64
% of variance	31.88	26.42
Cronbach's alpha	0.82	0.75

Note: Absolute value less than 0.10 were suppressed (-).

6.5.3 Factor analysis for intangible resources (Appendix J)

Exploratory factor analysis with varimax rotation was conducted on 20 items for intangible resource (detailed data see appendix J). There were four components with eigenvalues over Kaiser's criterion of 1 and in combination these explained 59.263 percent of the variance. The inspection of the scree plot criterion slightly identified a clear break after the three-factor solution. The factor analysis was analyzed again on the three-factor solution. The value of factor loading for items should be greater than 0.5. Items that cross-load with other factors would be considered if the factor-loading was greater than 0.60. In this case, four items were dropped (item A13, A14, A23 and A26) due to high cross-loading with other factors. The remaining 16 items were analyzed again. Finally, the factor concluded three factors which explained 55.55 percent of the variance, as shown in Table 6.15.

Table 6.15 reveals the results of the factor analysis for intangible resources after dropping four items. Factor 1 comprised six items which seem to relate to the practices and routines that are intended to meet customer requirements. These include frequent communication, interacting and building up trust and commitment to customers and business partners. Its factor loading accounts for 22.8 percent of the total variance. This research considers this factor as the approach that LSPs use to organize their organization; thus this factor is labelled organizational resources. Factor 2 comprised four items which seem to relate to recruitment, hiring, and the development of competent staff. Its factor loading accounts for 16.76 percent of total variance. Since this factor is all about acquiring and developing managerial expertise, it is labelled management expertise resources. Factor 3 comprised three items which seem to relate to relationship building through collaboration and communication aimed at creating better understanding and information sharing. Its factor loadings account for 15.99 percent of the total variance. This factor is labelled relational resources.

The organizational and management expertise resources achieved high reliabilities, with Cronbach's alpha 0.85 and 0.76 respectively (Appendix L). The scale for relational resource, 0.67 is close to the widely accepted cut-off value 0.70 and greater than the minimum recommended cut off value 0.6 for this new scale (Nunnally 1978; Rosenzweig, 2003).

Table 6.15: Factor analysis for intangible resources and capabilities

Items	Factor		
Intangible resources and capabilities	Factor 1	Factor 2	Factor 3
QA29 Ensure constant communication with business partner	**0.826**	0.208	0.102
QA22 Focus on customer requirement	**0.761**	(-)	0.237
QA25 Provide solution to customers	**0.738**	(-)	0.317
QA28 Ensure informal interaction with business partners	**0.726**	0.355	-0.104
QA20 Able to achieve customer satisfaction	**0.604**	0.184	0.289
QA19 Establish trust and commitment with business partners	**0.567**	0.258	0.337
QA11 Recruit experienced workers from the same industry	(-)	**0.792**	(-)
QA30 Provide management and leadership training	0.490	0.629	(-)
QA4 Provide IT training to upgrade logistics workers	0.264	**0.610**	0.368
QA1 Employ multi-experienced workers	(-)	**0.567**	0.344

QA8 Recruit logistics professional executives (expert in particular job/function)	0.169	**0.542**	0.371
QA10 Establish coordination/collaboration with business partner	(-)	0.156	**0.845**
QA9 Commit to share information amongst business partners	0.112	0.355	**0.626**
QA15 Require staff with good communication skill	0.350	(-)	**0.592**
QA12 Employ environmental policy	0.284	0.264	0.410
QA16 Recruit educated workers	0.246	0.402	0.404
Eigenvalue % of variance Cronbach's alpha	3.65 22.80 0.85	2.68 16.76 0.76	2.56 15.99 0.67

Note: Absolute value less than 0.10 were suppressed (-).

6.5.4 Factor analysis for logistics performances (Appendix K)

The same analysis was performed to identify factors for the logistics performance of LSPs. An inspection of the scree plot reveals a clear break after the two-factor solution and the Kaiser's criterion on 2 factors; this is the number of factors that are retained in the final analysis. Detailed outputs are shown at Appendix K.

Table 6.16 shows that 73 percent of the total variance is explained by two factors after dropping one item. One item, QB7 for cost is highly cross-loaded with factor 1. Factor 1 comprised six items which are primarily concerned with customer service and service innovation and seem to be related to the provision of new or innovative services. Its factor loadings accounts for 48.73 percent of total variance. This factor is labelled customer service innovation. Factor 2 comprised two items related to equipment and distribution costs. Its factor loading accounts for 24.19 percent of the total variance. This factor is labelled cost leadership.

The customer service innovation and cost leadership achieve high reliability with Cronbach's alpha coefficient of 0.92 and 0.82 respectively (Appendix L).

Table 6.16: Factor analysis for logistics performance

Logistics performance	Factor 1	Factor 2
QB8 Better services	**0.855**	0.250

QB5 Greater % of on time and accurate delivery	**0.826**	0.260
QB9 Quicker responses to customers	**0.808**	0.232
QB6 More unique solution	**0.807**	(-)
QB2 More satisfied with the service level	**0.770**	0.303
QB3 More additional service	**0.738**	0.355
QB7 Lower manpower cost	0.650	0.468
QB4 Lower equipment/facility cost	0.234	**0.887**
QB1 Lower distribution cost	0.234	**0.873**
Eigenvalue % of variance Cronbach's alpha	4.39 48.73 0.92	2.18 24.19 0.82

Note: Absolute value less than 0.10 were suppressed

Details of the factor analysis and the reliability for each key variable are attached in Appendix L. Table 6.17 shows the summary of variables and the reliability value. Items in each factor are then aggregated using mean scores to form component measures for subsequent analysis.

Table 6.17: Summary of variables and reliability value

No. Q	Resource-based logistics	Cronbach's Alpha
	Tangible and physical	
	Physical resource, 4 items	0.747
QA2	Logistics equipments (vehicles/warehouse/hub/base/other) to customers.	0.669
QA3	Software and computer system for logistics activities	0.704
QA17	Basic communication tools such as email, telephone, fax, etc for logistics activities	0.696
QA24	Logistics facilities and equipments are frequently maintenances	0.687
QA18	Product identification and tracking system (such as bar code, Electronic data interchangeable - EDI, IT solution or RFID)	Item not included
	Technology resource, 5 items	0.816
QA5	Web-based information system for all clients	0.795
QA6	Improvement logistics facilities	0.762
QA7	Improvement technology usage if it requires for logistics activities	0.765
QA21	Advanced equipments for logistics operations	0.792
QA27	New or technologically-advanced equipments for logistics operations	0.787
	Intangible resource	
	Management expertise resource, 4 items	0.707
QA1	Inclines to employ multi-experienced workers	0.667
QA4	Provides training to upgrade logistics workers	0.605
QA8	Inclines to recruit workers with logistics skills or knowledge	0.627
QA11	Inclines to recruit experienced workers from the same industry	0.671
QA16	Inclines to recruit educated workers	Item not included
QA30	Provides management and leadership training	Item not included

Relational resource, 3 items		0.670
QA9	Commits to share information among business partners	0.522
QA15	Provides staffs with a good communication skill	0.458
QA10	Establishes coordination/collaboration with business partners	0.717
QA23	Our business partners see our relationship establishment as a long term alliances	Item not included
QA26	Establish mutual relationship	Item not included
Organizational resource, 6 items		0.847
QA20	Provides customer satisfaction	0.829
QA22	Focuses on customer requirement	0.827
QA25	Provide solution to customers	0.817
QA19	Establishes trust and commitment among business partners	0.829
QA28	Establishes informal interaction between business partners	0.833
QA29	Establishes constant communication with business partners	0.797
QA12	Has corporate culture such as total quality management for quality service	Item not included
QA13	Employs environmental policy for safe/healthy/secure operations	Item not included
Q14	Employs continual improvement for sustainable service	Item not included

No.Q	Logistics performance	Cronbach's Alpha
Customer service innovation, 6 items		0.917
QB2	More satisfied with our service level	0.903
QB3	Having additional service	0.904
QB5	Offer greater percentage of on time and accurate delivery	0.895
QB6	Offer unique solution	0.914
QB8	Better services	0.891
QB9	Quicker responses to customers	0.902
Cost leadership, 2 items		0.817
QB1	Lower distribution costs	.a
QB4	Lower equipment or facilities costs	.a
QB7	Lower manpower costs	Item not included

6.5.5 Summary of constructs and measures of RBL

Among the basic exploratory principles of the resource-based logistics (RBL) is the idea that RBL enhance a firm. This research emphasises which logistics resources are acquired and how they translate into performance. RBL therefore makes up the independent variables that are influencing the performance of firms. Each individual component that comprises RBL can independently impact performance.

The independent variables are made up components of the RBL: namely, advanced physical resource, technology resource, organizational resource, relational resource and management expertise resource. The dependent variable is the performance of the firm which is made up of customer service innovation and cost leadership. The findings generated from the above analyses indicate how different resources, both tangible and intangible and capabilities and logistics performance are acquired by LSPs.

The physical aspect of RBL refers to the firm's hardware and software which support its information technology system as well as the structure and operating procedures that enable logistics activities. To enable an organization to provide excellent logistics services, LSPs require advanced equipment and strong technology support. The findings indicate that the two common tangible resources acquired by LSPs are advanced and basic physical resources.

Technology resource contains elements of new or technologically advanced equipment, web-based systems, and product identification technology. Given the rapid changes in technology, LSPs must be willing to make a continuous investment in the most advanced equipment and to make improvements in existing technology and facilities. Alternatively, they must cooperate with multiple service providers which offer advanced physical resources. Therefore many LSPs cooperate with multiple service providers in order to fulfil the demands of their customers.

Physical resource is another factor of RBL that contains elements of the basic resources for communication and logistics operations, such as: software and computer systems; as well as maintenance and computer facility/equipment. Most of the LSPs provide technology facilities such as resources for email, internet, EDI and identification and tracking systems. These are required in order to provide information for customers to track and trace shipments, and to automate processes and to integrate with the customer's information process.

The findings show that the intangible aspects of RBL acquired by LSPs are organizational resources, and relational and management expertise.

Organizational resource The attributes of organizational resources are found in the culture, routines, business processes and informal ways of doing things that enable a firm to conceive and implement strategies to improve its logistics performance. The analyses show that the contribution made by organizational resources to the firm's performance are facilitated by management practices, such as providing solutions to customers, a focus on customer requirements and satisfaction and establishing strong contact with business partners via constant communication, informal interaction, and commitment. This finding confirms the arguments of Ketokivi and Shroeder (2004) concerning manufacturing practice and process that have an impact on the firm's performance. When LSPs routinely create customer value to satisfy the end-user, this facilitates a more sustainable service and efficient delivery. It is this value that enables a firm to achieve both competitive advantage and core competence.

Relational resource The analyses show that relational resources contribute to the performance of a firm by building up collaborative relationships and by a commitment to sharing information with their customers. This supports the literature which states that the commitment to relationships is important in terms of increasing the exchange of strategic information (Kahn and Mentzer, 1998; Moberg et. al, 2002; Min et al., 2005; Davis and Mentzer, 2008) between the LSP and users. To enable LSPs to collaborate effectively and efficiently in the global market, employees are required to have good communication skills since collaboration is a human interaction (Panayides and So, 2005a; Panayides, 2007b; Sanders and Premus, 2005). This finding is not in agreement with the findings of Min et al. (2005) and Kahn and Mentzer (1998). The authors argue that a long term relationship is built on mutual trust. In reality, most LSPs have been trying to achieve higher levels of relational resource by engaging in contracts that last for an average of five years (Section: 6.3.4.1). This capability to lead, and to win or secure continuity of contracts is embedded in firms and is extremely hard to imitate.

Management expertise resource: Management expertise contributes to the performance of a firm by ensuring the recruitment of experienced workers from the same industry or workers with logistics skill and knowledge (who are experts in particular jobs) as well as hiring multi-experienced workers. Hiring is no longer an issue of merely filling vacancies but is more about investing in individuals who are capable of demonstrating the skills necessary to fulfil organizational tasks effectively. Given the era of information and knowledge, LSPs must develop and retain workers through training and education for upgrading management expertise. When an organization hires, develops and retains the best people, the firm increases its attributes in terms of management expertise. These attributes are most relevant to accomplishing outstanding service and customer satisfaction. This finding confirms the argument of Rueber (1997) concerning the acquisition and development of management expertise. In reality, most LSPs have been trying to achieve higher levels of management expertise by engaging in mergers and acquisitions or via joint-ventures and alliances (Wong and Karia 2010).

Management expertise is not easy to imitate; its development requires an investment of time and capital in order to meet the demands of unpredictable environmental changes.

Logistics performance Meanwhile, the findings generated from the analyses indicate logistics performance is operationalized into two variables. They are customer service innovation and cost leadership. Customer service innovation contains the elements of customer service: delivery, quality and flexibility and the innovative service element. These findings are not in agreement with the literature (Stainer, 1997; Myers et al., 1996) rather they are the result of a combination. Cost leadership (Rozenweig et.al, 2003) is made up of distribution costs and facility/equipment costs. The cost of labour/manpower is distributed to customer service innovation since LSPs have dedicated requirements for management expertise which is most likely to translate into customer service and service innovation.

CHAPTER 7: HYPOTHESES TESTING

7.1 Introduction

This chapter presents the correlation, the regressions and the post-hoc analyses. The correlation analysis is preliminary analysis to show the relationship between each RBL and each logistics performance. The simple linear regression is performed to test the first set of hypotheses. Step-wise regression analysis is performance to test the second set of hypotheses. The post-hoc analysis is performed to understand the bundling and mediation effects by hierarchical regression analyses. The chapter presents answers to research questions RQ2 to RQ4.

7.2 Correlation among Variables

This research examines the scatter plots of the standard residual (not shown) and found randomly and evenly dispersed data points throughout the plot, suggesting that the assumptions of normality, linearity and homoscedasticity have been met. Hence Pearson correlation is used in Table 7.1. The correlation between independent and dependent variables is above 0.3 with significance at $p < 0.01$ suggesting the existence of some correlations between all independent variables and dependent variables (Hair *at al.*, 2010). Since multicollinearity does not seem to be a serious problem ($R < 0.9$) the performance impacts of the five RBLs can be analysed independently.

Each dimension within the respective components of resource-based logistics is then used to construct inter-correlation matrices among the variables to determine the strength and direction of the bivariate relationships between variables. A correlation matrix using the Pearson product-moment coefficient is constructed to show these relationships (Table 7.1).

From the correlation matrix, all resources show some relationship with performance measure: customer service innovation and cost leadership ($r > 0.3$). Therefore the components of all RBL show a bivariate relationship with logistics performance. The correlation between RBL components and performance measure is positive and significant ($p < 0.01$).

Logistics performance in terms of customer service innovation is significantly correlated with organizational resources, $r = 0.54$, physical resources $r = 0.51$, management expertise resources $r = 0.45$, technology resources, $r = 0.38$ and relational resources, $r = 0.32$ (all $ps < 0.01$). Another is on cost leadership and is significantly correlated with organizational resources, $r = 0.45$, management expertise resources, $r = 0.37$, physical resources, $r = 0.32$, relational resources, $r = 0.32$ and technology resources, $r = 0.30$ (all $ps < 0.01$).

Table 7.1: Descriptive and correlations coefficient of the study variables

Variable Components of RBL	n*	Mean	Std. Deviation	**1**	**2**	**3**	**4**	**5**	6
1. Physical	123	4.20	0.57						
2. Relational	123	3.98	0.59	0.563**					
3. Technology	123	4.01	0.61	0.612**	0.412**				
4. Organizational	122	4.19	0.51	0.625**	0.485**	0.560**			
5. Management expertise	123	3.85	0.61	0.629**	0.538**	0.750**	0.467**		
Logistics performance									
6. Customer service innovation	122	4.00	0.60	**0.382****	**0.320****	**0.506****	**0.537****	**0.451****	
7. Cost leadership	122	3.58	0.76	**0.297****	**0.316****	**0.323****	**0.449****	**0.370****	0.533**

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

*. Sample size (n) adjusted for missing data.

Multi co-linearity

In this study data, the correlation between each independent variable (resources) is not too high meaning there is little combined effect between independent variables as correlation significant between independent variables is not more than $r<0.75$. So, these five RBL components can be separated independently. According to Pallant (2007) and Hair et al. (2006) multi co-linearity exists when the independent variables are highly correlated ($r = 0.9$ or above).

In summary, resources acquired by LPSs are found to be positively related to the customer service innovation and cost leadership with positive and significant at $p < 0.01$. The results of correlation analyses on these study variables imply that the higher the resources acquired the higher logistics performance of LSPs. The interest of this research lies in Malaysian logistics service providers that provide full and integrated logistics that have been in the industry for more than 15 years often reflecting the stability of the logistics industry in Malaysia. There is almost equal percentage of those fully and non-Malaysian-owned; and firm size representation.

This confirms the components of RBL that are operationalized in this research are important to logistics performance. Results from the correlations analysis indicate that each component of RBL has significant, positive impact on firm performance. However, this assumption requires further analysis. To further investigate such relationships the regression analyses are performed subsequently.

7.3 Simple Linear Regression Analyses

The set of hypotheses in the theoretical framework (Chapter Three) are intended to test the relationship between each RBL component and LSP performance by conducting regression analysis. The researcher assesses the contribution of each component of RBL on two performance measures: customer service innovative and cost leadership of logistics performance by determining the significance of the *F*-statistics (see p-value row) with the R^2 (refer to Table 7.2 – 7.6).

7.3.1 The performance impacts of technology resources (H1a-b)

Note that the *F*- value in Table 7.2 is significant at $p < 0.001$ for the two performance measures. The technology resources explain 26 percent of the variation in customer service innovation, and only 10 percent of variation in cost leadership. It makes 0.49 and 0.40 significant contributions at $p < 0.001$ then technology resources significantly predict the customer service innovation and cost leadership respectively.

These results support H1a-b, the higher the level of technology resource the greater is the customer service innovation and the cost leadership.

Table 7.2: Performance impact of technology resources (H1a-b)

Independent Variable	Customer service innovation	Cost leadership
Intercept	2.03****	1.97****
Technology	0.49****	0.403****
R^2	0.26	0.10
F	41.25	13.93
d.f	(1, 120)	(1, 120)
p-value	0.000	0.000

****.Significant at the 0.000; ***.Significant at the 0.001; **.Significant at the 0.005

7.3.2 The performance impacts of physical resources (H2a-b)

Note that the *F*- value in Table 7.3 is significant ($p < 0.001$) for the two performance measures. The regression model overall predicts both logistics performance significantly well. The physical resources explain 15 percent of the variation in customer service innovation; and 9 percent of variation in cost leadership. It makes 0.40 significant contributions at $p < 0.001$ then the physical resources significantly explain the customer service innovation and cost leadership.

These results support H2a-b, the higher the level of physical resource the greater is the customer service innovation and the cost leadership.

Table 7.3: Performance impact of physical resources (H2a-b)

Independent Variable	Customer service innovative	Cost leadership
Intercept	2.32****	1.91****
Physical	**0.40******	**0.40*****

R^2	0.15	0.09
F	**20.51**	**11.59**
d.f	(1, 120)	(1, 120)
p-value	0.000	0.001

****.Significant at the .000; ***.Significant at the .001; **.Significant at the .01

7.3.3 The performance impacts of management expertise resources (H3a-b)

Note that the *F*- value in Table 7.4 is significant at $p < 0.001$ for the two performance measures. The management expertise resources explain 20 percent of variation in customer service innovation and 14 percent of variation in cost leadership. It makes 0.44 and 0.46 significant contribution at $p < 0.001$ then management expertise resources significantly explain the customer service innovation and cost leadership respectively.

These results support H3a-b, the higher the level of management expertise resource the greater is the customer service innovation and cost leadership.

Table 7.4: Performance impact of management expertise resources (H3a-b)

Independent Variable	Customer service innovation	Cost leadership
Intercept	2.30****	1.80****
Management expertise	0.442****	0.464****
R^2	0.20	0.14
F	30.63	19.00
d.f	(1, 120)	(1, 120)
p-value	0.000	0.000

****.Significant at the 0.000; ***.Significant at the 0.001; **.Significant at the 0.005

7.3.4 The performance impacts of relational resources (H4a-b)

Note that the *F*- value in Table 7.5 is significant at $p < 0.001$ for the two performance measures. The relational resources explain 10 percent of the variation in both customer service innovation and cost leadership. It makes 0.33, and 0.41 significant contributions at $p < 0.001$ then the relational resources significantly explain the customer service innovation and cost leadership respectively.

These results support H4a-b, the higher the level of relational the greater is the customer service innovation and the cost leadership.

Table 7.5: Performance impact of relational resources (H4a-b)

Independent Variable	Customer service innovation	Cost leadership
Intercept	2.71****	1.95****
Relational	**0.33******	**0.411******
R^2	0.10	0.10
F	**13.72**	**13.35**
d.f	(1, 120)	(1, 120)
p-value	0.000	0.000

****.Significant at the 0.000; ***.Significant at the 0.001; **.Significant at the 0.005

7.3.5 The performance impacts of organizational resources (H5a-b)

Note that the *F*- value in Table 7.6 is significant at $p < 0.001$ for the two performance measures. The organizational resources explain 29 percent of the variation in customer service innovation and 20 percent of the variation in cost leadership. It makes 0.63 and 0.67 significant contribution at $p < 0.001$ then the organizational resources significantly explain the customer service innovation and cost leadership respectively.

These results support H5a-b, the higher the level of organizational resource the greater is the customer service innovation and the cost leadership.

Table 7.6: Performance impact of organizational resources (H5a-b)

Independent Variable	Customer service innovation	Cost leadership
Intercept	1.38****	0.77
Organizational	0.63****	0.67****
R^2	0.29	0.20
F	48.67	30.30
d.f	(1, 120)	(1, 120)
p-value	0.000	0.000

****.Significant at the 0.000; ***.Significant at the 0.001; **.Significant at the 0.005

To conclude, the model can only explain the percentage of the variation in customer service innovation and cost leadership. For instance in Table 7.2, the model only includes technology which can explain approximately 15 percent of the variation in customer service innovation. This means that 85 percent of the variation in customer service innovation might be explained by other variables which might also have an influence on it.

7.3.6 Summary of hypotheses

As posited in H1, H2, H3, H4 H5 (a-b), the overall empirical results demonstrate that the higher the RBL components the greater is the logistics performance. For example, the higher the advanced physical resource, the greater is the customer service innovation and cost leadership. A summary of hypotheses relating to the independent effect is supported and is shown in the following Table 7.7.

Overall, the results of this research provide strong support for the arguments that enhanced RBL components have significantly positive impact on logistics performance. The main goal to have the empirical evidence about the relationship between RBL components and logistics performance is, overall, satisfying. The next section discusses the analyses of the impact of RBL bundles on the logistics performance followed by intervention effects.

Table 7.7: A summary of the hypotheses

Hypotheses	
H1a: The higher the level of technology resource, the greater the customer service innovation	**Supported**
H1b: The higher the level of technology resource the greater the cost leadership	**Supported**
H2a: The higher the level of physical resource, the greater the customer service innovation	**Supported**
H2b: The higher the level of physical resource, the greater the cost leadership	**Supported**
H3a: The higher the level of management expertise resource, the greater the customer service innovation	**Supported**
H3b: The higher the level of management expertise resource, the greater the cost leadership	**Supported**
H4a: The higher the level of relational resource, the greater the customer service innovation.	**Supported**
H4b: The higher the level of relational resource, the greater the cost leadership	**Supported**
H5a: The higher the level of organizational resource, the greater the customer service innovation	**Supported**
H5b: The higher the level of organizational, the greater the cost leadership	**Supported**

7.4 Stepwise Regression Analyses

This research attempts to examine the impact of RBL bundles on logistics performance. Hence, the second set of hypotheses is applied to determine whether certain RBL bundles, when all together, would be able to explain any additional variance in performance than they would if acting on their own. RBL bundle is assessed to determine its ability to add to the prediction of logistics performance measures and to see which RBL components contribute most to explaining the variance. For this exploratory research, the stepwise regressions (stepwise) are performed to predict which RBL are best predictors for customer service innovation and cost leadership.

Preliminary analyses are conducted and ensured that there is no violation of the assumptions of normality, linearity, multi co-linearity and homoscedasticity (Section: 4.6.6). The two models of RBL bundles are presented in Figure 7.1 and 7.2 to show the variance and are added to the prediction of the logistics performance.

The R^2 values are between 20% to 35% are acceptable to explain logistics performance The results are consistent with previous results from the strategy literature (Ray et al., 2004) and logistics literature (Lai et al., 2008) for a resource to explain a percentage of the variance in operational performance. The resource commitment and managerial commitment respectively have explained 17% and 36.5% of variance in IT capability; while IT capability have explained 14%, 32.8% and 30.4% of variance in cost, service variety and service quality advantage respectively by a recent study of 3PL firms (Lai et al., 2008).

7.4.1 The bundling effects of RBL on customer service innovation (H6a)

The overall empirical results demonstrate that enhanced RBL lead directly to greater customer service innovation (CSI) ($p < 0.001$) (Table 7.8). Note that the Change in *F*-value is significant ($p < 0.001$). These two models describe how RBL components affected CSI performance. Each model is able to explain the percentage of the variance in CSI. In the final model, only two components of RBL are statistically significant, with the organizational resource given the stronger contribution than technology resources. Neither relational, physical nor management expertise resources make a unique contribution.

The first model, organizational resource, (0.63) explains 29 percent of variance in customer service innovation (CSI). It is a highly significant predictor of CSI. The second model, organizational and technology resources, explains 35 percent of variance in CSI but the other three RBL components (relational, physical and management expertise) have no significant impact on CSI. Both organizational (0.43) and technology (0.29) resources are significant predictors of CSI but the other three RBL components (relational, physical and management expertise) are no longer in the regression equation.

Table 7.8: Multiple regression results for customer service innovation

Independent Variable	Customer service innovation	
	Model 1	Model 2
Intercept	1.38****	1.03***
1. Organizational	0 .63****	**0 .43******
2. Technology		**0 .29 *****
R^2	0.29	0.35
F	48.67	32.02
d.f	(1, 120)	(2, 119)
p-value	0.000	0.000
Change in R^2		0.06
Change in *F*-value		11.02
d.f.		(1, 119)
p.value change		0.001

****.Significant at the 0.000;***.Significant at the 0.001; **.Significant at the 0.01

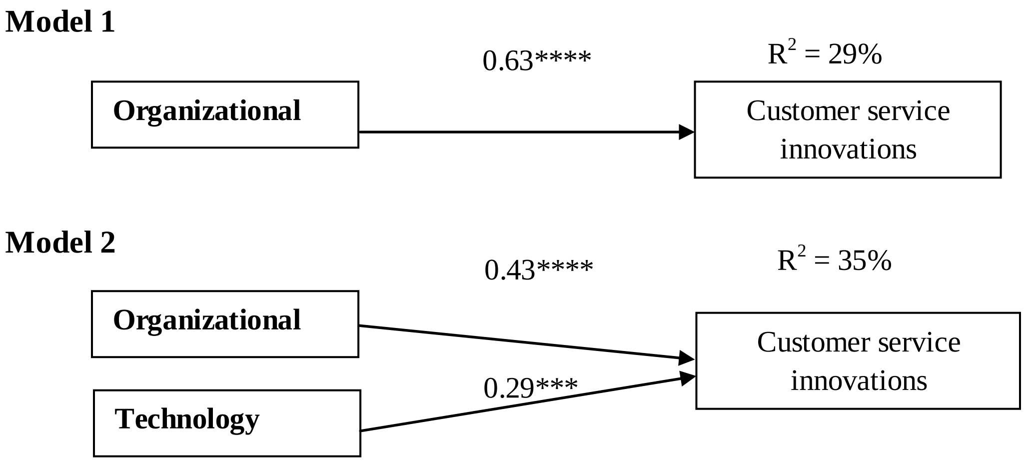


Figure 7.1: Model of bundling RBL for CSI

7.4.2 The bundling effects of RBL on cost leadership (H6b)

The overall empirical results demonstrate that enhanced RBL components lead directly to greater cost leadership (CL) ($p < 0.001$) (Table 7.9). Note that the Change in *F*- value is significant ($p < 0.05$). These two models describe how RBL components affected CL. Each model is able to explain the percentage of the variance in CL. In the final model, only two RBL components are statistically significant, with organizational resources given the strongest contribution over management expertise resources. Neither relational, technology nor physical resources make a unique contribution.

The first model, organizational resource, (0.67) explains 20 percent of variance in cost leadership (CL). It is a highly significant predictor of CL. The second model, organizational and management expertise resources, explain 23 percent of variance in CL. Both the organizational (0.53) and management expertise (0.26) resources are significant predictors of CL but the other three RBL components (relational, technology and physical) are no longer in the regression equation.

Table 7.9: Multiple regression result for cost leadership

Independent Variable	Cost leadership	
	Model 1	Model 2
Intercept	**0.77**	0.39
1. Organizational	**0.67******	**0.53******
2. Management expertise		**0.26****
R^2	0.20	0.23
F	30.31	18.22
d.f	(1, 120)	(2, 119)
p-value	0.000	0.000
Change in R^2		0.03
Change in F-value		11.02
d.f.		(1, 119)
p.value change		0.026

****.Significant at the 0.000;***.Significant at the 0.001; **.Significant at the 0.05

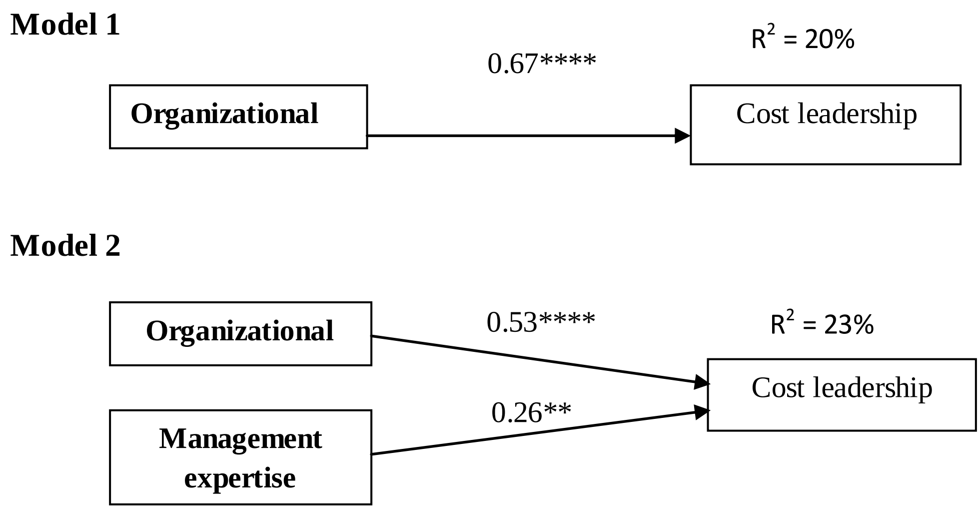


Figure 7.2: Model of bundling RBL for CL

7.4.3 Summary of hypotheses

The above findings support H6a-b that certain bundling of RBL enhances greater customer service innovation and cost leadership. Each model is able to predict CSI and CL. Organizational resources provide the strongest contribution to both logistics performance. Meanwhile, technology resources when bundling with organizational resources enhance greater customer service innovation. Management expertise resources when bundling with organizational resources enhance greater cost leadership. The results of hypotheses-testing the bundling of certain RBL on logistics performance is presented in Table 7.10.

Table 7.10: Summary of hypotheses testing: RBL impact on logistics performance

Hypotheses	Customer Service Innovation	Cost Leadership
H6: The bundling of certain RBL lead to greater logistics performance	Only organizational and technology resources lead to greater customer service innovation **H6a is supported**	Only organizational and management expertise resources lead to greater cost leadership **H6b is supported**

7.5 Interaction Effects

The post-hoc analysis is performed to further understand the interaction effect of logistics resources.

7.5.1 Interaction of organizational resources and other resources

The regression analyses were performed to investigate the interaction between resources. There is interaction if the unstandardized regression coefficients (B) for the resources interaction are significant at $p < 0.01$; however Table 7.11 indicates that there is no P-value smaller than 0.01. For example, the organizational and technology interaction for customer service innovation (B= 0.078, p= 0.564) and for cost leadership (B=0.417, p=0.028), and the organizational and management expertise interaction for customer service innovation (B=0.215, p=0.184) and for cost leadership (B=0.285, p=0.202) are not significant. The R-square change association with interaction terms are not significant at p=0.021. The results reveal no interaction between a predictor and moderator. Thus, it is not necessary to further explore the form of interaction (Frazier et al., 2004).

Table 7.11: Multiple regression for bundling organizational resources and other resources

Bundling organizational with other resources	Customer service		Cost leadership	
Step 2	Unstandardized B (p value)	R-square (p-value)	Unstandardized B (p value)	R-square (p-value)
Organizational x technology	0.078 (.564)	0.002 (.564)	0.417 (.028)	0.032 (.028)
Organizational x physical	0.363 (.021)	0.031 (.021)	0.494 (.021)	0.035 (.021)
Organizational x management expertise	0.215 (.184)	0.01 (.184)	0.285 (.202)	0.011 (.202)
Organizational x relational	0.350 (.029)	0.028 (.029)	0.310 (.154)	0.013 (.154)

7.5.2 Interaction of management expertise resources and other resources

The regression analyses were performed to investigate the interaction between resources. Overall the unstandardized regression coefficients (B) for the resources interaction are not significant at $p > 0.01$ (Table 7.12). For example, the management expertise and physical interaction for customer service innovation (B= -0.026 p =0.870) and for cost leadership (B=-0.095 p =0.661) and the management expertise interaction relational for customer service innovation (B= -0.073 p=0.599) and for cost leadership (B= -0.016 p =0.932) are not significant. The R-square change association with interaction term are not significant at p=0.05. The results reveal no interaction between a predictor and moderator. Thus it is not necessary to further explore the form of interaction (Frazier et al., 2004).

Table 7.12: Multiple regression for bundling management expertise resources and other resources

Bundling management expertise with other resources	Customer service		Cost leadership	
Step 2	Unstandardized B (p value)	R-square (p-value)	Unstandardized B (p value)	R-square (p-value)
Management expertise x technology	0.090 (.403)	0.004 (0.403)	0.148 (0.318)	0.007 (0.318)
Management expertise x physical	-0.026 (.870)	0.000 (0.870)	-0.095 (0.661)	0.001 (0.661)
Management expertise x organizational	0.215 (.184)	0.01 (0.184)	0.285 (0.202)	0.011 (0.202)
Management expertise x relational	-0.073 (.599)	0.002 (0.599)	-0.016 (0.932)	0.000 (0.932)

7.5.3 Interaction of technology resources and other resources

The regression analyses were performed to investigate the interaction between resources. Overall the unstandardized regression coefficients (B) for the resources interaction are not significant at p > .01 (Table 7.13). For example the technology and management expertise interaction for customer service innovation (B= 0.090 p =0.403) and for cost leadership (B=-0.148 p= 0.318) and the technology and physical resource interaction for customer service innovation (B= -0.017 p=0.904)) and for cost leadership (B= 0.145 p =0.463)) are not significant. The R-square change association with interaction term are not significant at p=0.05. The results reveal no interaction between a predictor and moderator. Thus, it is not necessary to further explore the form of interaction (Frazier et al., 2004).

Table 7.13: Multiple regression for bundling technology resource and other resources

Bundling Technology with other resources	Customer service		Cost leadership	
Step 2	Unstandardized B (p value)	R-square (p-value)	Unstandardized B (p value)	R-square (p-value)
Technology x management expertise	0.090 (0.403)	0.004 (0.403)	0.148 (0.318)	0.007 (0.318)
Technology x physical	-0.017 (0.904)	0.000 (0.904)	0.145 (0.463)	0.004 (0.463)
Technology x organizational	0.078 (0.564)	0.002 (0.564)	0.417 (0.028)	0.032 (0.028)
Technology x relational	-0.174 (0.183)	0.011 (0.183)	0-.087 (0.632)	0.002 (0.632)

7.5.4 Summary of interaction effects

The above empirical results demonstrate that organizational, management expertise and technology resources are not interacting with other resources. Thus, it is not necessary to further understand the form of interaction term since the results reveal no interaction term and the R-square change does not seem to explain an additional variation in customer service innovation and cost leadership. The following section will further the post-hoc analysis on mediation effects.

7.6 Mediation Effects

The series of regression analyses are performed to further investigation on the mediation effects (Baron and Kenny, 1986). To establish the mediation, the following is the series of regressions and steps to be held (Baron and Kenny 1986):

i) The independent variable significantly affects the mediator
ii) The independent variable significantly affects the dependent variable in the absence of the mediator
iii) The mediator has significant unique effects on the dependent variable

The two criteria are used to judge whether or not mediation is occurring. The first criterion is to identify the mediation effects informally. If the first three steps are met then partial mediation is indicated. If the effect of the independent variable on the dependent variable is zero or shrinks upon the addition of the mediator to the model then full mediation is indicated. The second criterion is to assess the mediation effects formally by using a statistical based method (Sobel Test).

7.6.1 The mediation effects of organizational resources

7.6.1.1 Customer service innovation

Table 7.14 shows the findings of regression for physical (PH), relational (RE) and management expertise (ME) in relation to organizational (OR) and customer service innovation (CSI). Step 1 empirically tests how the independent variable significantly affects the mediator. The results indicate that PH, RE and ME resources (independent variables) significantly affect organizational resources where no empirical study has been able to demonstrate this relationship. The findings are significant ($p < 0.001$) indicating that PH, RE and ME are positively related to organizational resource.

Step 2 empirically tests how the independent variable significantly affects the dependent variable in the absence of the mediator. The results indicate that PH, RE and ME resources significantly affects CSI. Thus PH, RE and ME resources are positively related to CSI

Step 3 empirically tests how the mediator has significant unique effects on the dependent variable. The results indicate that organizational resource ($p < 0.001$) has unique effects on CSI. The effects of PH and RE on CSI are not significant when organizational resource adds into the model. The results indicate that organizational resources fully mediate the relationship between PH and RE resources and CSI.

Meanwhile the effect of ME on CSI is still significant when organizational resource adds into the model. This holds the first three steps indicating that organizational resource partially mediates the relationship between ME and CSI. This implies that OR and ME have a direct effect on CSI and ME can indirectly affect CSI through OR. The model explains 34 percent of variance in CSI.

To test the mediation effects the Calculation for Sobel test is performed. The paths from PH to OR and RE to OR to CSI are significant (z-value = 4.32 and 4.14 respectively, $p < 0.001$). Z-value $= a*b$/Square root of $(b^2*s_a^2 + a^2*s_b^2)$ where a and b are unstandardized regression coefficients and s_a and s_b are their standard error for respective path. If z > 1.96 (p<0.05) the mediation effect is significant (refer to section 4.6.6). The z-value calculated is as follows:

Z-value = $a*b$/Square root of $(b^2*s_a^2 + a^2*s_b^2)$

= .565*.570/Square root of $(0.570^2*0.064^2 + 0.565^2*0.115^2)$

= 4.32

The results indicate that OR is the significant mediator for the relationship between PH and RE resources and CSI. This implies that OR has a direct effect on CSI and PH and RE have an indirect effect on CSI. Each model explains about 29 percent of variance in CSI.

However organizational resources are not the significant mediator for the relationship between technology resources and customer service innovation. Technology resources seem to be bundled together with organizational resources to enhance customer service innovation.

Table 7.14: The effects of organizational resource on CSI

Independent Variable	Organizational	Customer service innovation	
	Step 1	Step 2	Step 3
Intercept	1.82***	2.32****	1.28***
Physical (PH)	0.57****	0.40****	0.08
Organizational (OR)			0.57****
R^2	0.39	0.15	0.29
F	76.86	20.51	24.55
d.f	(1, 121)	(1, 120)	(2, 119)
p-value	0.000	0.000	0.000
Change in R^2			0.15
Change in F-value			24.56
d.f.			(1, 119)
p.value change			0.000

Independent Variable	Organizational	Customer service innovation	
	Step 1	Step 2	Step 3
Intercept	2.52***	2.72****	1.25****
Relational (RE)	0.42****	0.32****	0.08
Organizational			0.58****

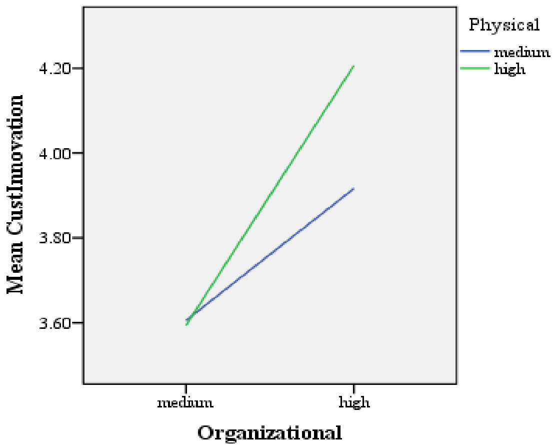
(OR)			
R^2	0.24	0.10	0.29
F	36.98	13.72	24.68
d.f	(1, 121)	(1, 120)	(2, 119)
p-value	0.000	0.000	0.000
Change in R^2			0.19
Change in F-value			32.10
d.f.			(1, 119)
p.value change			0.000

Independent Variable	Organizational	Customer service innovation	
	Step 1	Step 2	Step 3
Intercept	2.69***	2.31****	1.00****
Management expertise (ME)	0.39****	0.44****	0.25***
Organizational (OR)			0.49****
R^2	0.22	0.20	0.34
F	33.47	30.63	30.62
d.f	(1, 121)	(1, 120)	(2, 119)
p-value	0.000	0.000	0.000
Change in R^2			0.14
Change in F-value			24.59
d.f.			(1, 119)
p.value change			0.000

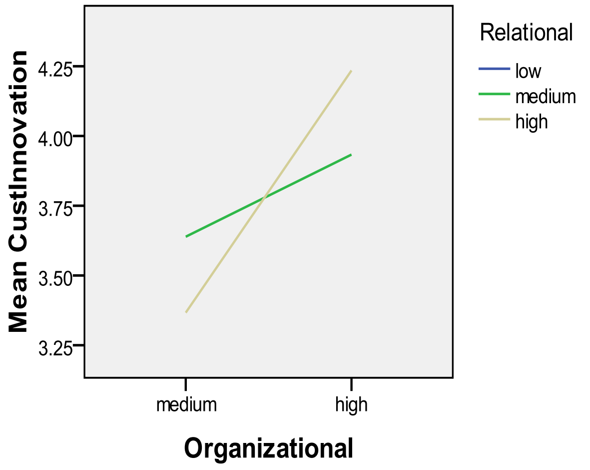
****. Significant at the 0.000; *** Significant at the 0.001; **Significant at 0.01; * Significant at 0.05

TE: Technology, PH: Physical, RE: Relational, ME: Management expertise, OR: Organizational, CSI: Customer service innovation

a.



b.



c.

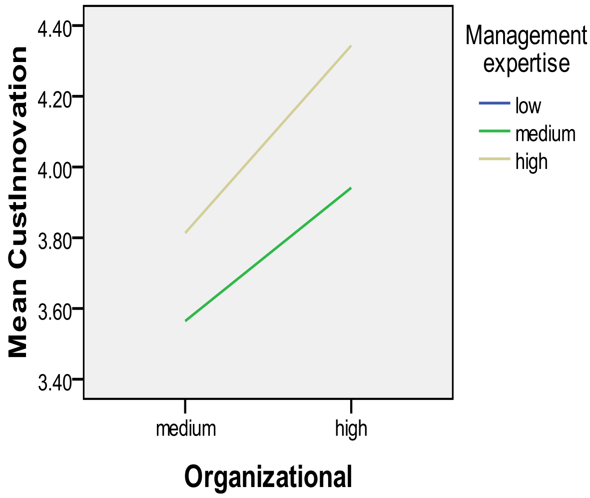


Figure 7.3: The mediation effect of organizational resources on CSI

Figure 7.3 is obtained by plotting the mean values of SCI for different mean values of organizational resources at varying levels of other resources. It shows the mediation effect of organizational on the impacts of other resources on customer service innovation. This research decides on a mean value of 1.67 or less considered as “low”, mean value in between 1.68 to 3.34 considered as “medium”, while mean values of 3.35 or higher considered as “high” for logistics resources. Then lines between mean values are drawn to illustrate the impacts of the mediator on the impacts of these resources on CSI.

The figure 7.3a shows the impact of organizational resources on customer service innovation. When organizational resources are medium, the impact on customer service innovation is positive when physical resources are medium or high. But the impact of organizational resources on customer service innovation is greater when physical resources are high as compared to when physical resources are medium. The impact of organizational resources on customer service innovation is greatest when organizational resources and physical resources are high. This implies that to enhance greatest customer service innovation LSPs should require high organizational resources when they have high physical resources.

The figure 7.3b shows interesting findings. When organizational resources are medium the impact of organizational resources on customer service innovation is greater when relational resources are medium as compared to when it is high. The impact of organizational resources is positive when relational resources are medium and high but when organizational resources are high the impact on customer service innovation is greatest when relational resources are high. This implies that to enhance greatest customer service innovation LSPs should acquire high organizational resources when they have high relational resources. With medium relational resources, there is no point for LSPs to have high organizational resources because a medium level of organizational resources with medium relational resources would be adequate to enhance greater customer service innovation, as emphasized in the interviews. This implies that LSPs should attempt to bundle their resources according to their resources development.

The figure 7.3c shows that the impact of organizational resources on customer service innovation is positive when management expertise resources are medium and high. But the impact is greater when management expertise resources are high. The impact of organizational resources on customer service innovation is highest when organizational and management expertise resources are high. This implies that to enhance greatest customer service innovation LSPs should require high organizational resources when management expertise resources are high.

7.6.1.2 Cost leadership

Table 7.15 shows the findings of regressions for technology (TE), physical (PH) and relational (RE) in relation to organizational (OR) to cost leadership (CL). Step 1 empirically tests whether the independent variable significantly affects the mediator. The results indicate that TE, PH and RE resources (independent variables) significantly affect organizational resources where no empirical study has been able to demonstrate this relationship. The findings are significant ($p < 0.001$) indicating that TE, PH and RE are positively related to organizational resource.

Step 2 empirically tests whether the independent variable significantly affects the dependent variable in the absence of the mediator. The results indicate that TE, PH and RE resources significantly affect CL. Thus TE, PH and RE are positively related to CL.

Step 3 empirically tests whether the mediator has significant unique effects on the dependent variable. The results indicate that organizational resource ($p < 0.001$) has unique effects on CL. The effects of TE, PH and RE on CL are not significant when organizational resource adds into the model. The results indicate that organizational resource fully mediate the relationship between TE, PH and RE resources and CL.

To test the mediation effects the Calculation for Sobel test is performed. The path from TE to OR, PH to OR and RE to OR to CL are significant (z-value = 3.49, 3.74, and 3.43 respectively, $p < 0.001$). The results indicate that OR is the significant mediator for the relationship between TE, PH and RE resources and CL. This implies that OR has a direct effect on CL and TE, PH and RE have indirect effect on CL. Each model explains above 20 percent of variance in CL.

However, organizational resources are not the significant mediator for the relationship between management expertise resources and cost leadership. Management expertise resources seem to be bundled together with organizational resources to enhance cost leadership.

Table 7.15: The effects of organizational resource on CL

Independent Variable	Organizational	Cost leadership

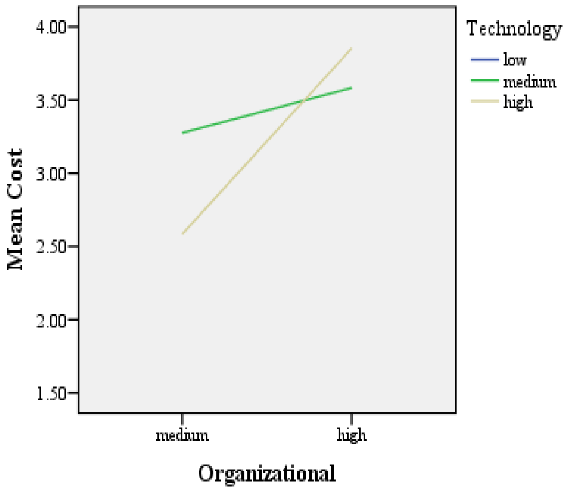
	Step 1	Step 2	Step 3
Intercept	2.30****	1.96****	0.62
Technology (TE)	0.47****	**0.41******	0.13
Organizational (OR)			**0.58******
R^2	0.31	0.10	0.21
F	**54.81**	**13.93**	**15.72**
d.f	(1, 120)	(1, 120)	(2, 119)
p-value	0.000	0.000	0.000
Change in R^2			0.11
Change in *F*-value			**15.79**
d.f.			(1, 119)
p.value change			0.000

Independent Variable	Organizational	Cost leadership	
	Step 1	Step 2	Step 3
Intercept	1.82***	1.90****	0.73
Physical (PH)	0.57****	0.**40*****	0.04
Organizational (OR)			**0.65******
R^2	0.39	0.09	0.20
F	**76.86**	**11.59**	**15.07**
d.f	(1, 120)	(1, 120)	(2, 119)
p-value	0.000	0.001	0.000
Change in R^2			0.19
Change in *F*-value			**17.00**
d.f.			(1, 119)
p.value change			0.000

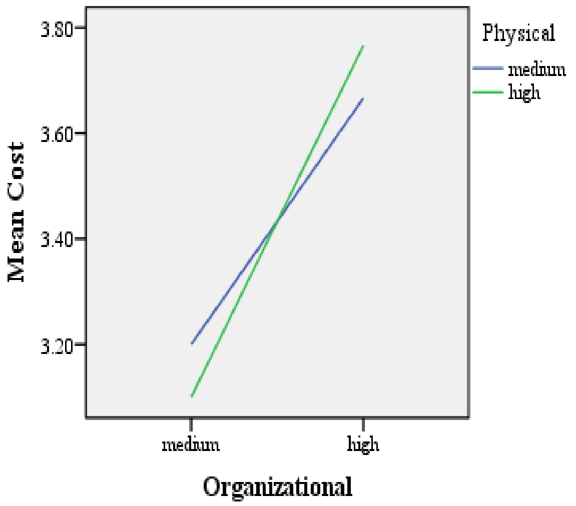
Independent Variable	Organizational	Cost leadership	
	Step 1	Step 2	Step 3
Intercept	2.52****	1.95****	0.501
Relational (RE)	0.42****	**0.41******	0.17
Organizational (OR)			**0.58******
R^2	0.24	0.10	0.21
F	**37.00**	**13.35**	**16.23**
d.f	(1, 120)	(1, 120)	(2, 119)
p-value	0.000	0.000	0.000
Change in R^2			0.11
Change in *F*-value			**17.30**
d.f.			(1, 119)
p.value change			0.000

****. Significant at the 0.000; *** Significant at the 0.001; **Significant at 0.01; * Significant at 0.05

TE: Technology, PH: Physical, RE: Relational, ME: Management expertise, OR: Organizational, CL: Cost leadership a.



b.



c.

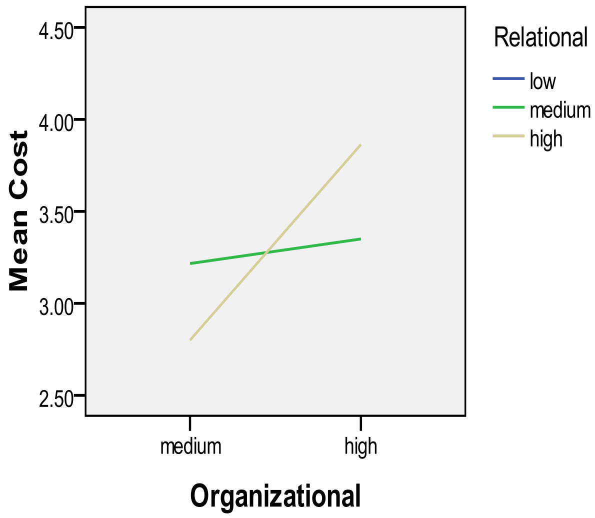


Figure 7.4: The mediation effect of organizational resources on CL

Figure 7.4 shows the mediation effect of organizational resources on customer service innovation. The same value of mean is applied as in the section 7.6.1. Then line graph is performed to understand the impact of mediators on resources and logistics performance relationship.

Figure 7.4 a, b and c shows the interesting findings. When organizational resources are medium the impact of organizational resources on cost leadership is greater when technology, physical and relational resources are medium as compared to when they are high. The impact of organizational resources is positive when these resources are medium and high. But when organizational resources are high the impact on cost leadership is greatest technology, physical and relational resources are high.

This implies that to enhance greatest cost leadership LSPs should require high organizational resources when they have high technology, physical and relational resources. However when organizational resources are medium, LSPs require medium technology, physical and relational resources to enhance greater cost leadership. This means a high level of organizational resources would not lead to cost leadership especially when there are levels of medium technology, physical and relational resources. As emphasized in the interviews most LSPs have 10% growth with medium level of such bundling resources.

7.6.2 The mediation effects of management expertise resources

Table 7.16 shows the findings of regressions for technology (TE), physical (PH) and relational (RE) in relation to management expertise (ME) to cost leadership (CL). Step 1 empirically tests whether the independent variable significantly affects the mediator. The results indicate that TE, PH and RE resources (independent variables) significantly affect management expertise resources where no empirical study has been able to demonstrate this relationship. The findings are significant ($p < 0.001$) indicating that TE, PH and RE resources are positively related to management expertise resource.

Step 2 empirically tests whether the independent variable significantly affects the dependent variable in the absence of the mediator. The results indicate that TE, PH and RE resources significantly affect CL. Thus TE, PH and RE are positively related to CL.

Step 3 empirically tests whether the mediator has significant unique effects on the dependent variable. The results indicate that organizational resource ($p < 0.001$) has unique effects on CL. The effects of TE, PH and RE on CL are not significant when management expertise resource adds into the model. The results indicate that management expertise resource fully mediate the relationship between TE, PH and RE resources and CL.

To test the mediation effects the Calculation for Sobel test is performed. The path from TE to ME, PH to ME and RE to ME to CL are significant (z-value = 2.24, 2.65, 2.61 respectively, $p < 0.001$). The z-value calculated is applied as in the section 7.6.1. The results indicate that ME is the significant mediator for the relationship between TE, PH and RE resources and CL. This implies that ME has a direct effect on CL and TE, PH and RE have indirect effect on CL. Each model explains above 14 percent of variance in CL.

However management expertise resources are not the significant mediator for the relationship between technological, physical and relational resources and customer service innovation. The physical and relational resources seem to support management expertise resources to enhance cost leadership. The management expertise resources also seem to support technology resources to enhance customer service innovation.

Table 7.16: The effects of management expertise on CL

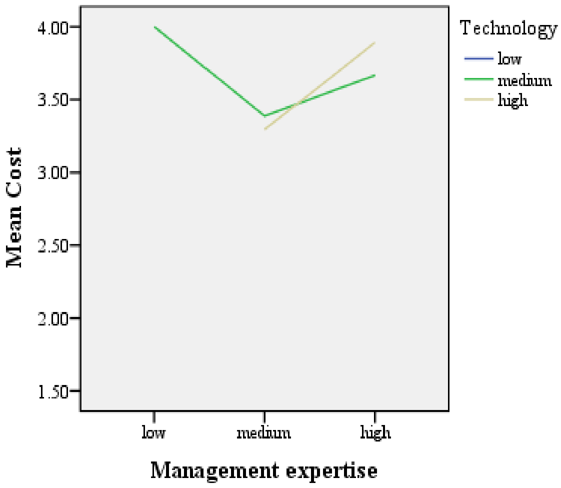
Independent Variable	Management expertise	Cost leadership	
	Step 1	Step 2	Step 3
Intercept	0.86***	1.96****	1.65****
Technology (TE)	0.75****	**0.41******	0.13
Management expertise (ME)			**0.37****
R^2	0.56	0.10	0.14
F	**155.26**	**13.93**	**9.80**
d.f	(1, 121)	(1, 120)	(2, 119)
p-value	0.000	0.000	0.000
Change in R^2			0.04
Change in F-value			**5.19**
d.f.			(1, 119)
p.value change			0.025

Independent Variable	Management expertise	Cost leadership	
	Step 1	Step 2	Step 3
Intercept	1.018***	1.90****	1.52***
Physical (PH)	0.67****	0.4**0*****	0.14
Management expertise (ME)			**0.38*** **
R^2	0.40	0.09	0.14
F	**79.39**	**11.59**	**9.98**
d.f	(1, 121)	(1, 120)	(2, 119)
p-value	0.000	0.001	0.000
Change in R^2			0.05
Change in *F*-value			**7.72**
d.f.			(1, 119)
p.value change			0.006

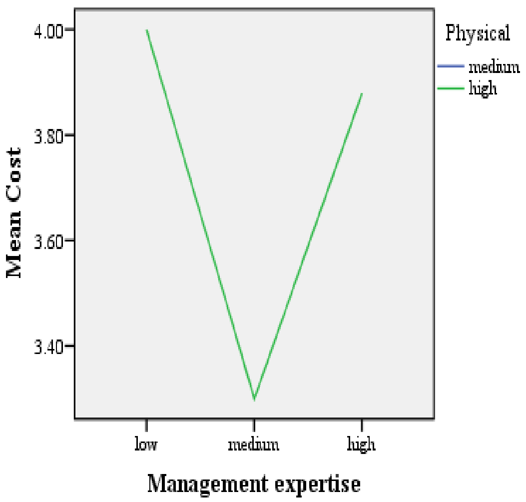
Independent Variable	Management expertise	Cost leadership	
	Step 1	Step 2	Step 3
Intercept	1.63****	1.95****	1.38***
Relational (RE)	0.56****	0.41****	0.21
Management expertise (ME)			**0.35*** **
R^2	0.29	0.10	0.16
F	**49.30**	**13.35**	**10.99**
d.f	(1, 121)	(1, 120)	(2, 119)
p-value	0.000	0.001	0.000
Change in R^2			0.06
Change in *F*-value			**7.88**
d.f.			(1, 119)
p.value change			0.006

****. Significant at the 0.000; *** Significant at the 0.001; **Significant at 0.01; * Significant at 0.05

TE: Technology, PH: Physical, RE: Relational, ME: Management expertise, OR: Organizational, CL: Cost leadership a.



b.



c.

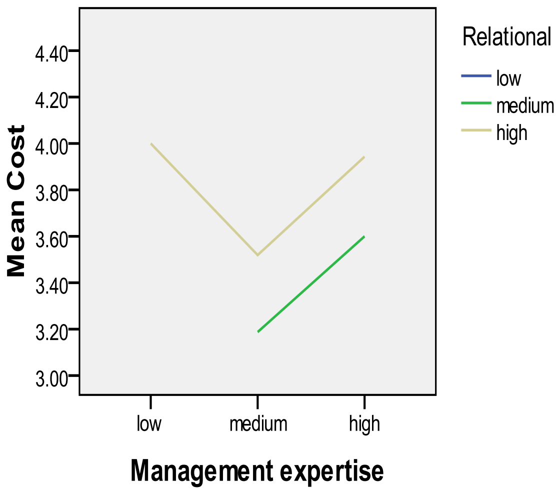


Figure 7.5: The mediation effect of management expertise resources on CL

Figure 7.5 shows the mediation effect of management expertise resources on cost leadership. The same value of mean is applied as in the section 7.6.1. Then line graph is performed to understand the impact of mediators on resources and logistics performance relationship.

Figure 7.5a shows interesting findings that the impact of medium technology resources on cost leadership is negative when management expertise resource is low to medium. However, when management expertise resources are medium to high, the impact of management expertise on cost leadership is positive and greater when technology resources are medium to high. This implies that to enhance cost leadership LSPs should acquire technology resources with appropriate level of management expertise resources. The impact on cost leadership is negligible if LSPs acquired low to medium technology resources with medium to high level of management expertise. This implies that if LSPs attempt to enhance greater cost leadership they should acquire medium to high management expertise with medium to high technology resources.

Figure 7.5b shows interesting findings that the impact of high physical resources on cost leadership is negative when management expertise resource is low to medium. However, when management expertise resources are medium to high, the impact of management expertise on cost leadership is positive and greater when physical resources are high. This implies that to enhance cost leadership LSPs should acquire physical resources with appropriate level of management expertise resources. The cost leadership is negligible if LSPs acquire low to medium physical resources with medium to high management expertise resources. This implies that if LSPs attempt to enhance greater cost leadership they should acquire medium to high management expertise with high physical resources.

Figure 7.5c shows interesting findings that the impact of high relational resources on cost leadership is negative when management expertise resource is low to medium. However, when management expertise resources are medium to high, the impact of the impact of management expertise on cost leadership is positive and greater when relational resources are medium and high. This implies that to enhance cost leadership LSPs should acquire relational resources with appropriate level of management expertise resources. The cost leadership is negligible if LSPs acquire low relational resources with medium to high management expertise resources. This implies that if LSPs attempt to enhance greater cost leadership they should acquire medium to high management expertise with medium to high relational resources.

7.6.3 The mediation effects of technology resources

Table 7.17 shows the findings of regression for physical (PH), relational (RE) and management expertise (ME) in relation to technology resource to customer service innovation (CSI). Step 1 empirically tests whether the independent variable significantly affects the mediator. The results indicate that PH, RE and ME resources (independent variables) significantly affect technology resources where no empirical study has been able to demonstrate this relationship. The findings are significant ($p < 0.001$) indicating that PH, RE and ME resources are positively related to technology resources.

Step 2 empirically tests whether the independent variable significantly affects the dependent variable in the absence of the mediator. The results indicate that PH, RE and ME resources significantly affect CSI. Thus PH, RE and ME are positively related to CSI.

Step 3 empirically tests whether the mediator has significant unique effects on the dependent variable. The results indicate that technology resource ($p < 0.001$) has unique effects on CSI. The effects of PH, RE and ME on CSI are not significant when technology resource adds into the model. The results indicate that technology resource fully mediate the relationship between PH, RE and ME resources and CSI.

To test the mediation effects the Calculation for Sobel test is performed. The path from PH to TE; RE to TE; and ME to TE to CSI are significant (z-value = 3.90, 3.60, and 3.14 respectively, $p < 0.001$). The z-value calculated is applied as in the section 7.6.1. The results indicate that TE is the significant mediator for the relationship between PH, RE and ME resources and CSI. This implies that TE has a direct effect on CSI and PH, RE and ME have indirect effect on CSI. Each model explains about 27 percent of variance in CSI.

However, technology resources are not the significant mediator for the relationship between physical, management expertise and relational resources and cost leadership.

The physical and relational resources seem to support technology resources to enhance customer service innovation. The technology resources also seem to support management expertise resources to enhance cost leadership.

Table 7.17: The effects of technology resource on CSI

Independent Variable	Technology	Customer service innovation	
	Step 1	Step 2	Step 3
Intercept	1.25****	2.32****	1.77****
Physical	0.66****	**0.40******	0.13
Technology			**0.43******
R^2	0.37	0.15	0.27
F	**72.29**	**20.51**	**21.46**
d.f	(1, 121)	(1, 120)	(2, 119)
p-value	0.000	0.000	0.000
Change in R^2			0.14
Change in *F*-value			**19.28**
d.f.			(1, 119)
p.value change			0.000

Independent Variable	Technology	Customer service innovation	
	Step 1	Step 2	Step 3
Intercept	2.30****	2.72****	1.70****
Relational	0.43****	**0.32******	0.13
Technology			**0.43******
R^2	0.17	0.10	0.27
F	**24.79**	**13.72**	**22.05**
d.f	(1, 121)	(1, 120)	(2, 119)
p-value	0.000	0.000	0.000
Change in R^2			0.17
Change in *F*-value			**27.36**
d.f.			(1, 119)
p.value change			0.000

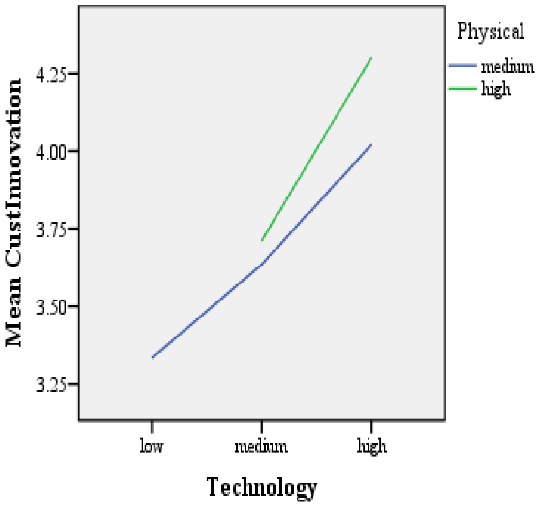
Independent Variable	Technology	Customer service innovation	
	Step 1	Step 2	Step 3
Intercept	1.11****	2.31****	1.88****
Management expertise	0.75****	0.**44******	0.16

Technology			**0.38******
R^2	0.56	0.20	0.27
F	**155.26**	**30.63**	**21.75**
d.f	(1, 121)	(1, 120)	(2, 119)
p-value	0.000	0.000	0.000
Change in R^2			0.06
Change in F-value			**10.45**
d.f.			(1, 119)
p.value change			0.000

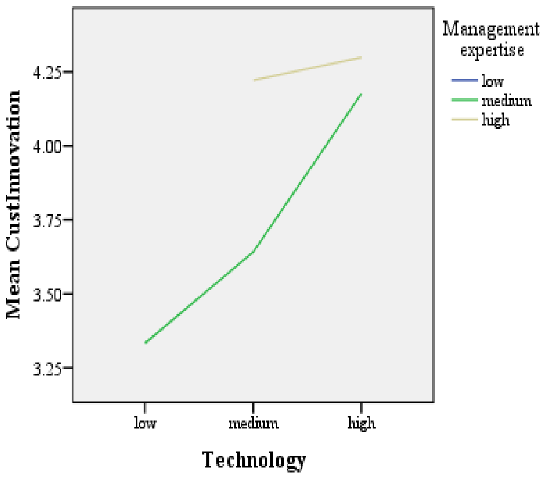
****. Significant at the 0.000; *** Significant at the 0.001; **Significant at 0.01; * Significant at 0.05

TE: Technology, PH: Physical, RE: Relational, ME: Management expertise, OR: Organizational, CSI: Customer service innovation

a.



b.



c.

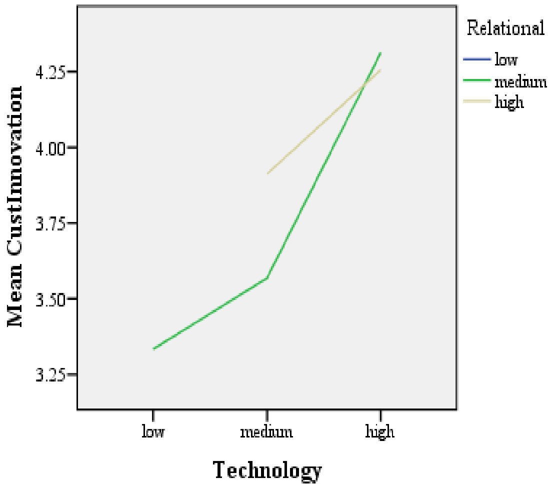


Figure 7.6: The mediation effect of technology resources on CSI

Figure 7.6 shows the mediation effect of technology resources on customer service innovation. The same value of mean is applied as in the section 7.6.1. Then line graph is performed to understand the impact of mediators on resources and logistics performance relationship.

Figure 7.6a, b and c show that medium physical, management expertise and relational resources enhance customer service innovation when technology resource is low to medium. However, when technology resources are medium to high the impact of technology resource on customer service innovation is greater when physical, management expertise and relational resources are high. This implies that to enhance customer service innovation LSPs should acquire technology resources. If LSPs attempt to enhance greater impact on customer service innovation LSPs should require medium to high technology resources with medium to high physical, management and relational resources.

7.6.4. Summary of mediation effects

The overall post-hoc analysis results of testing the mediation effects are summarized in Table 7.18. The results indicate that organizational and technology resources are significant mediators for LSP customer service innovation and organizational and management expertise resources are significant mediators for LSP cost leadership.

Table 7.18: Summary of results for post-hoc analysis

The mediation effects	
Organizational resource did not mediate the relationship between technology resource and customer service innovation. Technology resource is positively related to organizational resource. Organizational resource mediates the relationship between technology resource and cost leadership.	**Not mediated** **Fully mediated**
Physical resource is positively related to organizational resources. Organizational resource mediate the relationship between physical resource and customer service innovation Organizational resource mediate the relationship between physical resource and cost leadership	**Fully mediated** **Fully mediated**
Relational resource is positively related to organizational resources. Organizational resource mediate the relationship between relational resource and customer service innovation Organizational resource mediate the relationship between relational resource and cost leadership	**Fully mediated** **Fully mediated**
Management expertise resource is positively related to organizational resources. Management expertise and organizational resource is positively related to customer service innovation. Organizational resource mediate the relationship between management expertise resource and customer service innovation Organizational resource did not mediate the relationship between management expertise resource and cost leadership	**Partially mediated** **Not mediated**
Management expertise resource did not mediate the relationship between technology resource and customer service innovation Technology resource is positively related to management expertise resources Management expertise resource mediate the relationship between technology resource and cost leadership	**Not mediated** **Fully mediated**
Management expertise resource did not mediate the relationship between physical resource and customer service innovation Physical is positively related to management expertise resources Management expertise resource mediate the relationship between physical resource and cost leadership	**Not mediated** **Fully mediated**
Management expertise resource did not mediate the relationship between relational resource and customer service innovation Relational resource is positively related to management expertise resources Management expertise resource mediate the relationship between relational resource and cost leadership	**Not mediated** **Fully mediated**
Physical resource is positively related to technology resources Technology resource mediate the relationship between physical resource and customer service innovation Technology resource did not mediate the relationship between physical resource and cost leadership	**Fully mediated** **Not mediated**
Relational resource is positively related to technology resources Technology resource mediate the relationship between relational resource and customer service innovation Technology resource did not mediate the relationship between relational resource and cost leadership	**Fully mediated** **Not mediated**
Management expertise resource is positively related to technology resources Technology resource mediate the relationship between management expertise resource and customer service innovation Technology resource did not mediate the relationship between management expertise resource and cost leadership	**Fully mediated** **Not mediated**

7.7 Summary

LSPs acquire medium to high technology, physical, management expertise, relational and organizational resources in order to enhance greater customer service innovation and cost leadership. LSPs differ in the strategic resources (resources and capabilities) acquired and the bundling of certain RBL lead to significantly more positive and superior customer service innovation and cost leadership. The bundling of unique organizational and technology resources lead to significantly greater customer service innovation and the bundling of unique organizational and management expertise resources lead to significantly greater cost leadership. Hence, technology, physical, management expertise, relational and organizational enhance LSP logistics performance but greater impact is anticipated when bundling certain RBL at different levels. The post-hoc findings indicate that the organizational, management expertise and technology resources are significant mediators for LSP logistics performance. Hence LSPs acquire physical, management expertise and relational resources to support their organizational and technology resources to enhance greater customer service innovation. Meanwhile LSPs acquire technology, physical and relational resources to support their organizational and management expertise resources to enhance greater cost leadership.

CHAPTER 8: DISCUSSION OF RESULTS

8.1 Introduction

This chapter presents a comprehensive discussion of the findings of this research. It discusses the extent to which the analyses performed in the Chapter 5, Chapter 6 and Chapter 7 are able to answer the research questions RQ2 to RQ4 and to achieve the four objectives set out for this research. These discussions are supported largely by theory and literature. It begins with the definition, identification, conceptualization and measurement of the construct of resource-based logistics (RBL) and its components , logistics performance, then moves on to the impacts of RBL on logistics performance (RQ2 to RQ3) and finally the management of RBL (RQ4).

8.2 Resource-based Logistics (RBL) and its Components (RQ1)

The main objective of this research is to investigate resource-based logistics by identifying, conceptualizing and measuring the construct of RBL within the LSP context and then examining the extent to which RBL impacts logistics performance in terms of customer service innovation and cost leadership. The first objective of this research is to conceptualize and measure the RBL constructs. This objective was achieved by answering RQ1 via literature review, interviews and a survey with Malaysian LSPs.

From the interviews, all the LSPs appeared to acquire a medium to high level of information communication technologies including email, internet, satellite-based tracking, EDI computerized to support their interactions and transactions with customers. Over 70 percent of the LSPs actively acquired physical resources such as warehousing, trucks, specialized equipment and new advanced equipment/facilities to deliver logistics services. Over 85 percent of the LSPs acquired or built rapport and relationship with clients and further developed communication skills to support negotiation and information sharing. In addition, over 70 percent of the LSPs acquire or develop organizational resources such as organizational routines and procedures to comply with customer requirements. More than half of the LSPs acquired management expertise by hiring experienced, calibre and skilful staffs. The interview findings are supported by the logistics literature which identifies technology and physical resources such as information system, equipment and facilities (Lai, 2004; Stefansson, 2006), relational resources (Panayides and So, 2005a), people (Skjoett-Larsen 2000; Lai et al., 2005) and organizational resources (Brah and Lim, 2006; Ellinger et al., 2008) as determinants of performance of LSPs (Yang et al., 2009; Wong and Karia, 2010).

This research contributes to the logistics literature by developing the conceptualization and measurement of the resource-based logistics resources (RBL) constructs from the LSP perspective. The interview findings help to develop 30 measurement items for RBL and nine items for logistics performance, which are used to develop a survey questionnaire. The interviews and factor analyses results confirm that Malaysian LSPs' resources are comprised of tangible resources and capabilities in terms of technology and physical resources, and intangible resources and capabilities including management expertise, relational and organizational resources. These findings support the RBV theory which divides resources into tangible and intangible (Grant, 1991; Hunt, 2001; Ray et al., 2004) and is consistent with the logistics literature (e.g. Mentzer et al., 2004; Lai, 2004).

Basically the results conclude that tangible and physical resources of Malaysian LSPs include logistics and IT infrastructure such as a firm's hardware and software which support technology systems as well as its structure and operating procedures to enable the logistics operations and activities. To enable an organization to provide excellent logistics services, Malaysian LSPs also acquire advanced equipment and strong technology support. The results conclude that the two common tangible resources acquired by Malaysian LSPs may be categorized as technological resources and physical resources.

From the factor analyses, technology resource contains elements of an LSP's ability to provide new or technologically advanced equipment, web-based systems, advanced equipment for logistics operations and improvement for logistics facilities and technology usage. These constructs are similar with previous logistics studies which identify automated material handling and automated storage (Brah and Lim, 2006), web-based information systems for tracking and tracing shipment information (Lai et al., 2004; Lai et al., 2005) and improvement in technologies (Lowson, 2003) and information technology and systems (Lai et al., 2008) as technology resources. The results indicate that Malaysian LSPs have the ability to provide investment for technology resources which increase an LSP's ability to improve the technology usage to keep up with and up-date advanced IT and IS. These constructs of technology resources have not previously been identified by logistics literature.

Technology resources are comprised of rather advanced technology in information technology and information systems including web-base systems, logistic systems and technology for the improvement and maintenance of logistics systems and equipments. Given the rapid changes in technology, LSPs must be willing to make a continuous investment in most advanced equipment and improvement in technology and facilities also. These technology resources are acquired to improve the competencies in innovation capability to have control over logistics activity for delivery operations, and to acquire, process and transmit information (Sanders and Premus, 2005). The results indicate that most Malaysian LSPs are moving towards 'technology-enabled' logistics service firms, as coined by Lai (2004). Similar resources such as 'information equipment resources' were identified by a study of Taiwanese container shipping firms (Yang et al., 2009), and 'IT capability' was identified by another study of US manufacturing firms (Sanders and Premus, 2005).

Another essential tangible resource acquired by Malaysian LSPs is physical resource. It is an important part of RBL being an element of an LSP's ability to provide logistics facilities and equipment, improvement and maintenance, IT infrastructure such as basic communication tools, IT facilities (e.g. bar-code and EDI facilities), hardware and software. These constructs have been identified by logistics literature which consider movement facilities and hardware facilities (Closs and Thompson, 1992), warehousing, transportation operations and packaging equipments (Stefansson, 2006), improvement and maintenance (Lowson, 2003) and logistics ICT (Chapman et al., 2003) as physical resources. The results indicate that Malaysian LSPs provide investment in physical resources and improvement and maintenance in logistics and IT infrastructures. These constructs of physical resources have not previously been identified by logistics literature.

The Malaysian LSPs' physical resources include basic communication and computer systems and logistics facilities called basic physical resources. It is interesting to see that Malaysian LSPs differentiated basic physical resources from advanced technology resources. Such basic physical resources are required for any LSP to administer business process and communicate with business partners and customers, as emphasized in the interviews. Such basic physical resources have not been identified by the logistics literature before but previous management information system literature has included them into the IT capability construct and called them ‘physical IT assets’ (Bharadwaj, 2000; Huang et al., 2006).

In addition, the factor analyses also identified three intangible resources and capabilities of RBL which include management expertise, relational and organizational resources. The construct of management expertise resources include elements of LSPs’ inclination and commitment to develop and recruit experienced workers from the same industry or workers with logistics skills and knowledge (expert in particular job), multi-experienced workers and provide training and education. Such constructs are identified as education and training (Drew and Smith, 1998), hiring experienced professionals (Murphy and Poist, 2000) and employing skilled people (Poist et al., 2001; Rassaque and Sirat, 2001) as management expertise resources. The results are inconsistent with some logistics literature which identifies educated workers (Myer et al., 2004) and management and leadership training (Poist et al., 2001) as management expertise resources. These developments and conceptualizations of management expertise resources have not been identified by logistics literature but it has been reported in information systems literature (Rueber, 1997) that specific skills, multiple experience (the acquisition of multiple expertise), and concrete experience (instead of the duration of experience) as management expertise. So far the constructs of management expertise resources have not been reported in the logistics literature. These are the first empirical results and thus a novel contribution.

The results conclude that management expertise resources are essential intangible resources and capabilities. Management expertise basically comes from individuals who are capable of demonstrating the skills necessary to fulfil organizational tasks effectively. They are acquired for managing all aspects of logistics operations and activities. The contribution of management expertise resources to LSP performance arguably originates from the LSP’s commitment in recruiting experienced workers from the same industry, workers with logistics professional (logistics skills and knowledge), multi-experienced workers and providing appropriate training (Drew and Smith, 1998;

Skjoett-Larsen, 1999; Ellinger et al., 2002; Murphy and Poist, 2007). The importance of knowledge and expertise in IT has been widely recognized by logistics literature from the user or outsourcer perspective. The importance of human resources for LSPs has only recently been highlighted by Lai et al. (2005), Ellinger et al. (2008), and Wong and Karia (2010). The factor analyses further confirm the importance of intangible human capital largely advocated by the human capital literature (Becker, 1963). Given the current age of information and knowledge, LSPs must continuously develop and retain workers through recruitment, training and education.

The factor analyses also identified that relational resources are the next intangible resources and capabilities for LSPs. The results conclude that relational resources are a basic requirement for resources and capabilities of RBL. The attributes of relational resources include elements of collaborative relationships, communication and commitment on sharing information with their customers. Such constructs are identified as commitment in relationships to increase strategic information exchange (Kahn and Mentzer, 1998; Moberg et. al, 2002; Min et al., 2005; Davis and Mentzer 2008) between the LSP and users. Another construct is communication which is essential for collaboration and interaction in the global market (Panayides and So, 2005a; Panayides, 2007b; Sanders and Premus, 2005) as concluded in the interviews. The results are inconsistent with logistics literature which identified mutual understanding (Kahn and Mentzer, 1998) and long term relationship (La Londe and Master, 1994; Gunasekaran and Ngai, 2003) as relational resources. It is interesting to see that Malaysian LSPs require collaborative relationships, communication and commitment on sharing information with customers and suppliers for relational resources. The results indicate that Malaysian LSPs require workers with communication skills to support negotiation and information sharing as concluded in interviews. These have not previously been reported in logistics literature and are thus a novel contribution.

Essentially, the Malaysian LSPs' relational resources comprised of mainly collaborative relationships, commitment on sharing information with customers via effective communication. This takes into account 'trust' and 'share value' previously identified by Panayides and So (2005a). This observation supports the literature which argues that the commitment in relationship is important to increase strategic information exchange between the LSP and users (Kahn and Mentzer, 1998; Moberg et. al, 2002; Min et al., 2005; Davis and Mentzer 2008). To enable LSPs to collaborate effectively and efficiently in global markets, LSPs acquire people with good communication skills since collaboration involves human interactions (Panayides and So, 2005a; Panayides, 2007b; Sanders and Premus, 2005). Indeed the majority of logistics managers from the companies interviewed confirm that they emphasize and seek people who have a good command of English and communication skills. These create superb rapport with customers and increase sales. The survey data concludes that Malaysian LSPs have an average five years in contract. These capabilities are embedded in leading Malaysian LSPs to win or secure continuity of contracts which are extremely hard to imitate.

The last intangible resources and capabilities identified by the factor analyses are organizational resources. Organizational resources are the most important intangible resources and capabilities of RBL. The results indicate that Malaysian LSPs execute practices and routines to provide solutions to customers, focus on customer requirements and satisfaction, and further establish commitment on trust, constant communication and interaction for organizational effectiveness. Such constructs are identified by previous logistics literature as customer orientation (Ellinger et al., 2008), managerial involvement (Lai et al., 2008) and organizational encouragement (Lin, 2008). The results are inconsistent with previous logistics literatures which identified culture such as continual improvement for sustainable service, total quality management and environmental policy for safety and health (Brah and Lim, 2006; Gunasekaran and Ngai, 2003) as organizational resources. It is interesting to see that Malaysian LSPs establish management commitment on trust and frequent communication and interaction among business partners and practice customer focus and satisfaction as the construct of organizational resources. The results indicate that Malaysian LSPs participate highly and interact with customers and suppliers when they make inquires or request changes. These developments and conceptualisations of organizational resources have not been identified by logistics literature before and are thus a novel contribution

The Malaysian LSPs' organizational resources and capabilities focus on practices and routines by providing solutions to customers and focusing on customers' requirements and satisfaction, and further establish management commitment on trust and constant communication and interaction. The results indicate that Malaysian LSPs conduct their business based on emphasising customer needs and requirements; and providing solutions to their customers, enabling them to be different from competitors. In addition, the strong form of trust between business partners is the most critical part of a Malaysian LSP's organizational resources to conduct business between customers and suppliers. Such organizational resource constructs have not previously been identified by logistics literature but the strategy literature broadly includes organizational culture and trust (Barney and Clark, 2007) as an organizational capability to differentiate firms from each other. Such resources are identified as 'IT-enabled intangible' which focus on customer orientation, better coordination and increased responsiveness (Huang et al., 2006). It is no surprise to find that organizational resources, comprised of mainly process and strategy, ensure interactions with customers and emphasize customer satisfaction, indicating the importance of market orientation (Ellinger et al., 2008).

8.3 The impact of RBL on Logistics Performance (RQ2 and RQ3)

The third objective is set out to understand the relationship between RBL and logistics performance. It answers RQ2 and RQ3 with regards to the impact of various RBL on logistics performance.

Firstly, the research findings fill the gap in the logistics literature by providing much needed empirical support, on development of logistics performance constructs and measures for LSPs. The logistics literature recognizes that the logistics performance scales have adopted different approaches for conceptualization and measurement for logistics performance. Both the performance of logistics users (e.g. manufacturers and retailers) and providers (LSPs) are generally measured in terms such as cost efficiency, delivery and quality, followed by customer service, flexibility and innovation (e.g. Myers et al., 1996; Daugherty and Pittman, 1995; Larson and Kulchitsky 1999; Sanders and Premus, 2005; Brah and Lim, 2006; Panayides, 2007b; Ellinger et al., 2008). Previous scholars suggest different constructs for measuring logistics performance and yet it remains unclear which key performance indicators (KPIs) should be used for logistics performance measurement (Wilding and Juriado 2004).

From the factor analyses results logistics performance constructs (dependent variables) of this research are factored into customer service innovation and cost leadership. This implies that customer service innovation and cost leadership should be used as KPI for all LSPs. The customer service innovation includes elements of customer service (delivery, quality and flexibility) and service innovation, the main logistics performance leading to competitive advantage of LSPs. Unquestionably, competitive advantage in terms of cost performance such as cost distribution and facility/equipment are equally important for LSPs (e.g. Daugherty and Pittman, 1995; Lai et al., 2008). These two performance measures are two essential performance constructs required for LSPs to be assessed since an LSP has multiple aspects of business operations. Basically, the results are consistent with logistics literature (Mentzer et al., 2004) which argues that logistics capabilities contribute to a firm’s competitive advantage via cost reduction and customer service. This research also supports RBV theorists (Huselid et al., 1997; Ray et al., 2004) arguing that resources and capabilities should have different impacts on cost and customer service advantage.

Secondly, the results of this research provide a strong support for arguments that resources and capabilities have positive significant impacts on LSP performance. Basically, the five RBL - technology, physical, management expertise, relational and organizational resources are found to have direct and bundling effects on Malaysian LSP logistics performance. Basically the results are consistent with expectations of RBV theory (Penrose, 1959; Wenerfelt, 1984; Rumelt, 1984; Barney, 1991; Barney and Clark, 2007) which argues that idiosyncratic resources (valuable, rare, inimitable and non-transferable) are the determinants of firm performance. The results indicate that all five RBL are positively associated with customer service innovation and cost leadership for Malaysian LSPs. These are RBL idiosyncratic resources or specific resources and capabilities acquired, developed and controlled by Malaysian LSPs.

In terms of technology resource, the results strongly support the arguments of Hammant (1995) that ‘information technology’ enables information to be accessed and used to support logistics operations in order to deliver competitive advantage. Previous studies have so far confirmed the positive impacts of information-based capability on logistics performance in manufacturing firms (e.g. customer needs, delivery date and new products) (Shang and Marlow, 2005). The results similar to those of Lai et al. (2006), suggest the positive relationship between information technology (IT) and 3PL service, quality and cost advantage. Technology resources are essential for Malaysian LSPs to control their logistics activities and support their business process.

The results indicate that Malaysian LSPs have the ability to acquire technology resources and further provide investment in technology resources for advanced equipment and ability to improve the technology usage to keep up with and up-date advanced IT and IS. These technology resources help LSPs to keep track of customer orders and provide feedback to customer leading to cost and service advantages (Lai et al., 2008). Such technology resources enable innovation capability which LSPs use to enhance their control over logistics activity through enhanced communication, transmission, processing of information and delivery. Malaysian LSPs acquire effective information systems (IS) for data processing efficiency and data maintenance accuracy (Daugherty et al., 1999) which leads to customer service innovation and cost leadership. This implies that LSPs should continually develop and invest in advanced technology resources such as new or technologically advanced equipment, for example, automated storage and warehousing, web-based information systems, GPS and GIS to keep up with changing technology and to be better than competitors, as indicated by Langley and Capgemini (2007).

Those LSPs who do take advantage of such technology resources to deliver value added service to their customer are arguably able to excel in customer service innovation and cost leadership. The results are consistent with most research in strategic IT that technology adds economic value to a firm by either reducing a firm's cost or differentiating its services (Porter and Millar, 1985; Bakos and Treacy 1986; Wiseman 1988).

The findings also support arguments for cost advantage and customer service innovation advantage of physical resources. Logistics infrastructure, for example, movement and hardware facilities resources will lead to significantly higher levels of delivery efficiency (Closs and Thompson, 1992). Equipment and facilities such as warehouses, transportation and packaging equipment (Stefansson, 2006) or physical tools and machines for assembling, repackaging and warehousing with EDI linkage are important for effective delivery (Lai, 2004). The results are similar to the strategy literature which argues that plant, facilities and equipment contribute to a firm's growth (Penrose, 1959; Wernerfelt, 1984; Barney, 1991), support the entire firm's operations to produce and provide services and place (Penrose, 1959) and speed up production and cost advantage (Barney and Clark, 2007). So far the positive association between physical resources and logistics performance in terms of customer service innovation and cost leadership have not been reported so the results represent the very first empirical evidence from strategy and logistics literature. The results are thus a novel contribution.

The results indicate that Malaysian LSPs have the ability to provide logistics facilities and equipment, facilities and equipment improvement and maintenance, IT infrastructure such as basic communication tools, IT facilities (e.g. bar-code and EDI facilities), and hardware and software facilities are positively related to customer service innovation and cost leadership. Since it has not been examined by logistics literature before it is interesting to see that these basic physical resources are acquired by Malaysian LSPs to support the administration and they are directly related to service innovation and cost leadership. Moreover, Malaysian LSPs provide investment in their physical resources for improvement and maintenance in logistics and IT infrastructure. The performance implications of physical resources or similar constructs have been reported by non-logistics literature (e.g. Huang et al., 2006) but the results are inconsistent, that IT-infrastructure capability does not directly affect firm performance. Further research is required to examine these contradictory findings.

So far very few logistics studies have examined the relationships between management expertise resources (Lin, 2008), relational resources (Panayides and So, 2005a) and organizational resources (Lai et al., 2008) and LSP performance. The results of this research confirm that management expertise resources are positively associated with customer service innovation and cost leadership. The findings are consistent with the human capital literature (Wright et al., 1995; Rueber, 1997). The theory of human capital posits that management expertise generates value to a firm (Becker, 1964; Wright et al., 1994) and supports the RBV theory (Barney 1991). The results support the logistics literature argument for cost advantage and customer service innovation of management expertise resources. Logistics literature suggests the importance of human assets and training for logistics management (Chiu, 1995; Skjoett-Larsen, 2000; Lowson, 2003). Chapman et al., (2003) argue that new knowledge, quality and expertise of human resources attributes may enhance service innovation in logistics companies (Chapman et al., 2003) and Lai et al. (2005) suggest that LSPs need information technology expertise to develop or manage advanced technology. So far the positive association between management expertise resources and logistics performance in terms of customer service and innovation has not been reported so this is the first empirical evidence for the logistics literature.

The results indicate that management expertise resources significantly enhance customer service innovation and cost leadership. In this era of information and knowledge, Malaysian LSPs incline to develop and recruit management expertise resources. The results imply that Malaysian LSPs should hire multi-experienced and experienced workers from the logistics industry because these people are capable of demonstrating the skills necessary to fulfil organizational tasks effectively. Proper training and education provided to employees increases their knowledge and skills to improve customer service and cost. These imply that LSPs should enhance the acquisition of multiple expertises and continuously develop and improve their staff by hiring solidly experienced staff (instead of years of experience). LSPs can employ workers with managerial IT skills and knowledge either from the logistics industry or others to enhance logistics performance. These specific skills, knowledge, experience and abilities are difficult to transfer to another firm, even if an employee from one firm transfers to another which can have an impact on customer service innovation and cost leadership. In fact LSPs often acquire new skills, knowledge, and are well-versed in using technology and qualities in their people to deliver services and improve cost.

The results of this research indicate that relational resources are positively related to logistics performance. Malaysian LSPs' collaborative relationships through communication and commitment to sharing information with their customers and suppliers are positively related to customer service innovation and cost leadership as relational resources. Malaysian LSPs also emphasize communication skills to support negotiation and information sharing for relational resources. Previous studies have so far confirmed the positive impacts of 'relationship orientation' and LSP innovation and logistics service quality (Panayides, 2006). The results, similar to those of user perspective, suggest that coordination or cooperation between business partners often leads to improved performance (Forza, 1996), lower costs and better delivery performance (Goffin et al., 1997).

This is consistent with strategic literature and supports the resource-advantage theory of competition (Hofer and Schendel, 1978; Tomer, 1987; Hunt, 1997; 2001) that relational resources have a beneficial impact on firm performance. The results of this research suggest that relational resources facilitate networking and allow more LSPs to collaborate with, and better understand, customers. LSPs need to acquire relational resources to support interaction and negotiation with customers and manage logistic contracts effectively.

The results suggest that LSPs with higher performance also had high levels of organizational resources. In fact the results indicate that organizational resources are the most critical resources of Malaysian LSPs. This is consistent with strategic literature (Nelson and Winter, 1982; Porter, 1985, Ray et al., 2004) that a firm's activities or routines can affect its competitive advantage and performance. So far the positive associations between organizational resources and performance have been reported by non-logistics literature (e.g. Edelman et al., 2005); the results of this research represent the very first empirical evidence from the logistics literature. The performance implications of organizational resources or similar constructs have been acknowledged but there was a lack of empirical evidence in the logistics literature. The results are thus a novel contribution.

Even though all the above five logistics resources are found to positively associate with customer service innovation and cost leadership, further analyses indicate that not all of the five logistics resources directly affect these two performances, especially when they are bundled together. The strategy literature suggests that the bundling of tangible and intangible resources will enhance firm performance because these resources may complement each other (Amit and Schoemaker, 1993; Barney, 1991; Teece et al., 1997). Previous logistic literature has suggested the need for bundling of logistics resources but the ways and orders in which resources can be bundled effectively are still a 'black box' (Olavarrieta and Ellinger, 1997). This research is the first logistics research to fill this critical gap. Particularly, the results of this research indicate that organizational resources and technology resources are bundled together to improve customer service innovation while organizational resources and management expertise resources are bundled together to improve cost leadership.

The bundling of organizational resources and technology resources is essential because organizational strategies and routines which are required to deliver customer service and develop service innovation rely heavily on effective communication with customers via the use of novel information technology. This novel finding has some managerial implications. Logistics managers should recognize the need to adjust organizational resources with changing technology to fulfil ever increasing customer requirements. Instead of merely developing organizational resources to meet customer needs, LSPs should simultaneously acquire and develop advanced technology resources to support logistics operations and to enhance customer service innovation. Organizational resources and technology resources alone may be valuable and rare but when they are bundled together they become inimitable and non-transferable, leading to greater and superior customer service innovation. Previous strategy literature suggests that superior performance is dependent on firms' ability to bundle their productive resources and capabilities (Penrose, 1956; Wernerfelt, 1984) or unique resources together (Rumelt, 1984).

The results also suggest that the bundling of organizational resources and management expertise resources is essential for enhancing cost leadership. This is because of the need for skilful, knowledgeable and experienced people to execute and implement organizational strategy and routines, especially when it comes to cost reduction. This is perhaps a crucial clue for explaining why many LSPs were not able to achieve cost reduction (Langley and Capgemini, 2007). Also, organizational resources and management expertise resources, together, form bundles of processes and accumulated knowledge which are socially complex or, therefore, less likely to be imitated and substituted. Previous strategy literature suggests that inimitable and non-substitutable resources are most likely to be the sources of sustainable competitive advantage (Rumelt, 1984; Dierickx and Cool, 1989). Previous study argues that competitive advantage based on human resources is much more difficult to imitate than competitive advantage from other resources (Teece et al., 1997; Barney and Clark, 2007). This means logistics managers need to develop organizational resources and enhance management expertise at the same time which makes it difficult to imitate and eventually achieve sustainable cost leadership.

It is interesting to find that these two bundles of RBL represent an LSP's unique resources which are causally ambiguous, difficult to be understood by other providers and sometimes by the LSPs in which they are developed The differences in terms of strategic resources LSPs possess, as well as the ways in which resources are bundled discovered by this research, further our understanding of the heterogeneity among LSPs within the logistics industry. The main insight here is that, organizational resources alone are valuable and rare but they are more likely to be inimitable and non-transferable resources when bundled with technology and management expertise resources in a particular manner, leading to greater competitive advantage. Organizational resources alone lead to greater performance but sustainable competitive advantage is anticipated when they are bundled with other capabilities. The results of this research are consistent with strategic literature on resources and capabilities theory (Amit and Schoemaker, 1993; Barney, 1992; Teece et al., 1997, Carpenter and Sander 2001) arguing that a firm gains greater competitive advantage when resources and capabilities are bundled with other resources.

The above findings suggest the need to distinguish firm-specific resources from unique resources. Since the unique combinations of organizational, management expertise and technology resources are socially complex and embedded in structural/organizational capital they are more likely to be inimitable and non-transferable, thus becoming the source of SCA for logistics companies. Such RBL are called unique RBL. This implies that these bundling effects of organizational resources with other capabilities within an LSP derive causal ambiguity which is difficult for competitors to duplicate. It is thus worth emphasizing that the results of this research contributes to the theory of bundling resources and capabilities and further provides empirical evidence on how organizational resources shall be bundled to explain greater customer service innovation and cost leadership performance. Our knowledge of the resources and capabilities for LSP competitive advantage has now been enhanced from the recognition of the importance of five major resources and capabilities (Wong and Karia, 2010) to the detailed insights about how organizational, management expertise and technology resources and capabilities may be bundled together to enhance the customer service innovation and cost leadership of LSPs.

The above results do not mean that the other resources are not important because the results of this research confirm that all other resources are independently and positively associated with LSP logistics performance, which have already been acknowledged by prior strategy and logistics literature. Since organizational resources are identified as the most significant resources when bundled with other resources, this means there is a need for the capability to bundle all other resources together to improve customer service innovation and cost effectiveness. This implies that LSPs should focus on developing their organizational practices, procedures and routine resources alongside strategy development and implementation. Such a capability is causally ambiguous and, therefore, hard to imitate and substitute by competitors. This is perhaps the most significant contribution of this research, suggesting a lot more future research opportunity to uncover the ways in which LSPs should bundle, organize and manage other resources.

In addition there are other factors may also affect logistics performances which are not examined in this research. In the context of this research, logistics performance may depend on a variety of factors. Despite of resources and capabilities, marketing strategy have been reported to have positive significant impact on the performance of 208 LSPs (Panayides, 2004). There is growing evidence suggesting that a different strategic development for different levels of logistics outsourcing (Hertz and Alfredsson, 2003), different strategic orientation (Yeung et al., 2006), marketing strategy (Panayides, 2004) and different operations strategy (Lowson, 2003) are perhaps other crucial factors for affecting logistics performances.

8.4 Managing Appropriate RBL (RQ4)

The enhanced knowledge on how RBL may be managed more effectively comes from the understanding of the direct, indirect and mediation effects discovered by this research. The discovery of the mediation effects of unique RBL (organizational, management expertise and technology resources) is essential because those unique RBL are used to transform others logistics resources into customer service innovation and cost leadership performance. Logistics managers should recognize the need to appropriately manage RBL to ensure their greatest impacts on customer service innovation and cost leadership. Basically, LSPs should acquire a high level of organizational, management expertise and technology resources because these resources not only influence customer service innovation and cost leadership directly but also positively mediate the relationships between other logistics resources and logistics performance. So far the mediation effects of organizational resources, management expertise and technology resources have not been reported so the results of this research represent the very first empirical evidence reported in the logistics literature. The results are thus a novel contribution.

Strategy literature suggests that resources and capabilities will have a direct effect on firm performance (Penrose, 1959) but over time, firms develop their unique resources and capabilities in order to maximize the utilization of other valuable resources and in turn yield a superior performance (Penrose, 1959; Amit and Shoemaker, 1993; Makadok, 2001). Similar to Porter's (1991) argument, a firm develops resources and capabilities to implement future activities, routines and business processes. Since firms' resources and capabilities are developed over time, therefore, it is important for logistics managers to understand how unique resources affect specific resources to significantly enhance the greatest impact on performance.

The results of this research indicate that those unique RBL (e.g. organizational, management expertise and technology resources) mediate the relationship between firm-specific RBL and logistics performance. Malaysian LSPs have acquired firm-specific RBL and, in turn, lead to its ability to support organizational, management expertise and technology resources and capabilities to enhance greatest impact on logistics performance. For example, the results indicate that an LSP's physical resources such as computer hardware and software (resources and capabilities) play an important role in supporting administration processes, logistics operations and service provisions which, in turn, enable Malaysian LSPs to enhance the effectiveness of their organizational routines and procedures. As discovered by this research, organizational resources embed in organizational routines and cultures which emphasize customer orientation and allow LSPs to enhance interactions with suppliers and customers; when logisticians communicate effectively with customers and suppliers, there will generate customer service innovation and cost leadership advantage. These organizational resources and capabilities developments take some time to develop because it involves some complicated path-dependent and socially complex processes. This implies that, while the physical (firm-specific) resource is important, only the organizational resources (unique) are likely to be the major source of sustained competitive advantage.

The evidence from the results of mediation effects indicate that organizational resources fully mediated the relationships between physical and relational resources and service innovation but organizational resources partially mediated the relationship between management expertise resources and customer service innovation. The results suggest that warehouse and transportation facilities, and collaboration relationships with customers and suppliers are the fundamental requirement for Malaysian LSPs to fulfil their customer needs and satisfaction. Furthermore, experienced and knowledgeable workers will respond to those customers' requests and attend to customers problems which, in turn, improve organizational effectiveness to achieve greatest customer service innovation. In terms of cost leadership, organizational resources are found to fully mediate the relationships between technological, physical and relational resources and cost leadership. The results indicate that advanced equipment such as automated warehousing and storage require effective logistics and IT infrastructures such as computer hardware to provide value added services and solutions to customer requests. These technologies and physical resources are crucial for Malaysian LSPs to improve cost effectiveness in terms of data re-entry, human error and paper. Furthermore LSP cooperation and information sharing lead to establishing trust and commitment; and constant communication and interaction among business partners to improve operations time and cost for preparing many documents.

These results suggest that organizational resources are the most essential resources for LSPs to improve customer service innovation and cost leadership. The results imply that physical and relational resources are not directly affecting these two performance but their performance implications must go through, or rely on, organizational resources. Similarly, LSP technology resources do not directly affect cost leadership but they must go through organizational resources to influence cost leadership. These physical, relational and technological resources are negligible if Malaysian LSPs do not develop high level organizational resources to commit in terms of understanding logistics performance and transforming LSP strategy and objectives into practices and routines. Meanwhile only LSP management expertise resources have demonstrated a "dual effect" on customer service innovation; management expertise had a direct effect and organizational resources mediated effect on customer service innovation. This is perhaps a crucial clue for explaining why some specific resources are not directly related to firm performance. The strategic literature (Powell and Dent-Micallef, 1997; Ray et al., 2004) argues that most mature firms (such as matured 3PLs in the logistics industry) can all acquire firm-specific resources such as physical and technology resources; such resources are easy to imitate and, therefore, they are not able to directly affect customer service performance (Powell and Dent-Micallef, 1997; Ray et al., 2004).

So far very few studies have examined the relationships between technological, physical, management expertise, relational resources and organizational resources. The results confirm that the productive technology, physical, management expertise and relational resources have an influence on an LSP's organizational resources. The results indicate that they are positively related to organizational resources. This implies that such productive resources can provide a better support to enhance organizational resources. The results are similar to those of Yang et al. (2009) and Lai et al. (2008) from the logistics literature and Huang et al. (2006) from the operations literature, suggesting the positive relationships between 'resource' and 'service capability'; 'resource commitment' and 'IT capability'; or between 'human IT resources and IT-infrastructure' and 'IT-enabled intangible' such as emphasized in customer orientation. While the study of US manufacturing firms by Sanders and Premus (2005) concludes a direct and positive relationship between collaboration and firm performance, this research uncovers that the impact of relational resources on logistics performance is not direct, but mediated by organizational resources.

LSPs acquire a high level of physical and technology resources to enable communication, transmission and processing information to support delivery and logistics operations and further support LSPs to develop organizational resources and capabilities to deliver efficient distribution services and improve logistics facilities and equipment. The results also suggest that logistics managers should acquire a high level of relational resources for a better understanding of customer needs, an effective and interactive participation and effective management of contracts, which are all executed through a high level of organizational resources, leading to improved customer service innovation and cost leadership. Furthermore, the results suggest that a high level of management expertise resources have an influence on organizational resources. The recruitment of people of calibre or the provision of appropriate training and education to develop management expertise often leads to improved customer service innovation. This is because individuals who are capable of demonstrating the necessary skills will fulfil organizational tasks more effectively (Wright et al., 1994). LSPs require a high level of management expertise to support organizational routines and processes which implement strategies and objectives and synthesize them into practices, routines or activities to improve their customer service innovation.

So far this research is the first logistics research to examine the combined effects of organizational resources and other resources. This research indicates that the impact of organizational resources on customer service innovation and cost leadership is the greatest when combined with all physical and relational resources and organizational resources at high levels. Meanwhile the impact of organizational resources on customer service innovation is the greatest only when LSPs' organizational resources and management expertise are at high levels. The results suggest that Malaysian LSPs with a high extent of logistics and IT infrastructure, professional workers and cooperative relationships are negligible if organizational and technology resources are not at a high level. So far the combined effects of high physical, management expertise and relational resources influencing high organizational and technology resources to have the greatest impact on customer service innovation have been not been reported. These are thus a novel contribution.

Another observation is that the impact of organizational resources on cost leadership is greatest only when LSPs' organizational and technology resources are at high levels. Similarly the results suggest that Malaysian LSPs with a extensive, advanced equipment and technology resources, logistics facilities and communication and sharing information are negligible if organizational and management expertise resources are not also extensive. So far the combined effects of extensive technology, physical and relational resources influencing organizational and management expertise resources to have the greatest impact on cost leadership have not been reported. The results are thus a novel contribution.

The results suggest that management expertise resources are essential for enhancing cost leadership. Management expertise resources fully mediate the relationship between technology, physical and relational resources and cost leadership. The results imply that technology, physical and relational resources do not directly affect cost leadership but their performance impacts on cost leadership must go through management expertise. For example, the results indicate that Malaysian LSPs require a high level of management expertise for the effective and efficient use and utilization of a high level of technology, physical and relational resources. While former resources are often important to enhance cost leadership, only management expertise resources are likely to be the major sources of cost leadership. The results support RBV theory and human capital theory (Penrose, 1959; Youndt et al., 1996) that people (possess skills, knowledge and ability) are the ultimate sources of sustainable competitive advantage.

As far as the positive relationships between technological, physical and relational resources and management expertise resources are concerned, this research provides the very first empirical evidence for the logistics literature. The results confirm that the productive technology, physical and relational resources have an influence on LSPs' management expertise resources. The results indicate that they are positively related to management expertise resources. Malaysian LSPs have acquired extensive technology and physical resources to facilitate their innovation capabilities in logistics and established good rapport with customers and suppliers. Effective advanced equipment and logistics facilities will reduce the number of staff being employed. This is perhaps a crucial clue for explaining why Malaysian LSPs were able to enhance cost leadership because they have minimized the cost of manpower by increasing number of skills and knowledge workers to perform multi-tasking jobs as emphasized by the interviews. Moreover, established good rapport and effective interaction will increase the number of contracts. This is, perhaps, a crucial clue for explaining why Malaysian LSPs were able to enhance cost leadership because they have developed and hired a team of experienced and reliable professionals. These management expertise resources will handle invoices and documentation correctly so that their customers will not hijack their business or shipment as concluded by the interviews.

LSPs also require logistics managers with multi-tasking and good communication skills to enhance relationships with customers and supplier to have a better understanding of business partners and a more effective sharing of information. Thus, to achieve cost competitiveness, it is clear that Malaysian LSPs should focus on improving their management expertise resources; management expertise was lacking, even though most LSPs have already acquired a high level of technology and physical resources, as concluded by the interviews.

So far this research is the first logistics research to examine the combined effects of management expertise resources and other resources. For example, the results indicate that the impact of management expertise resources on cost leadership was the greatest when all technology, physical and relational resources and management expertise resources were at high levels. The impact of management expertise resources on cost leadership was decreased and meaningless when LSP management expertise resources acquisition was at a low to medium level. The results suggest that Malaysian LSPs have acquired a team of experienced staff to manage logistics operations. Such experienced staff will enhance the impact of LSP technology, physical and relational resources on cost leadership. LSPs can cut costs by employing less staff and only employ appropriate staff. This has led to low operations costs and increased productivity. This implies that logistics managers need to develop a high level of management expertise resources which are unique and difficult to imitate in order to achieve sustainable cost leadership. The results are thus a novel contribution.

Another novel contribution is the mediation effects of technology resources on the relationships between physical, management expertise and relational resources and customer service innovation. The results suggest that technology resources fully mediate the relationships between physical, management expertise and relational resources and customer service innovation. The results imply that technology resources are essential for enhancing customer service innovation. The results imply that physical, management expertise and relational resources do not directly affect customer service innovation but their impact on customer service innovation must go through technology resources. The results indicate that Malaysian LSPs have acquired advanced information technology and systems (IT and IS); and logistics equipment that are used to acquire, process and transmit information but the effectiveness of these processes depends on physical, management expertise and relational. This implies that physical, management expertise and relational resources are important to enhance customer service innovation, only technology resources are likely to be the direct source of customer service innovation advantage. The results support RBV theory (Barney and Clark, 2007) and IT literature (Porter and Millar, 1985; Bakos and Treacy 1986; Wiseman 1988) that technology resources are the source of sustainable competitive advantage by differentiating its products or services.

Technology resources are essential for LSPs to control their logistics activities and support their business processes. The new or technologically advanced equipment such as automated storage and warehousing are the most critical part for technology resources. Web-based information systems often depend on computer platforms, communication technology and software systems. Such technology resources lead to innovation capability which LSPs use to enhance their control over logistics activity through enhanced communication, transmission, processing of information and delivery. An effective information system (IS) is another important part of technology resources for data processing efficiency and data maintenance accuracy (Daugherty et al., 1999). In addition, investment in technology resources will ensure an LSP's advanced equipment and improvement in logistics facility and technology. These technology resources will increase an LSP's ability to execute improvement and technology usage to keep up with and up-date advanced IT and IS or other sophisticated technologies (Wu et al., 2006). Such technology resources are used to acquire process and transmit information for more effective decision making (Sander and Premus 2005). Technology resources enable information to be accessed and used by various parties in the logistics network.

So far the positive relationships between physical, management expertise and relational resources and technology resources have not been reported so the results of this research represent the very first empirical evidence from the logistics literature. The results confirm that the productive physical, management expertise and relational resources have an influence on LSP technology resources. The results indicate that they are positively related to technology resources. Malaysian LSPs have a high level of physical, management expertise and relational resources to support LSPs in developing highly advanced technology resources. While the study of Taiwan LSPs by Lin (2008) concludes a direct and positive relationship between quality of human resources and technology adoption (RFID), this research reveals that physical, management expertise and relational resources have a positive association with technology resources to enhance logistics performance.

So far this research is the first logistics research to examine the combined effects of technology resources. For example, the results indicate that regardless of the level of technology resources, the association between technology resources and customer service innovation was positive when all physical, management and relational resources acquisitions are at a medium level and above. Certainly when LSP technology resources acquired is at a high level the level of customer service innovation was the greatest. This implies that if LSPs only acquire a low level of technology resources, there is no point in acquiring high levels of physical, management expertise and relational resources because a medium level of such resources would be adequate to enhance customer service innovation, as emphasized in the interviews. The results suggest that Malaysian LSPs have utilized their resources appropriately by complementing each other to enhance customer service innovation.

The above results indicate that despite unique RBL such as organizational, management expertise and technology resources, other resources are equally important because the results confirm that such other LSP specific RBL support those unique RBL to enhance impact on service innovation and cost leadership advantage. This means there is a need for LSPs to acquire specific RBL and develop their unique resources and capabilities to enhance customer service innovation and cost effectiveness and to sustain competitive advantage. Organizational, management expertise and technology resources are unique capabilities which are developing over time, path dependent and causally ambiguous and, therefore, hard to imitate and substitute by competitors. Perhaps the most important contribution of this research is the uncovering of the effective ways in which LSPs should bundle, organize and manage firm specific and unique resources. This research contributes to the theory of resource bundling and further provides empirical evidence on the tenuous relationships between RBL and customer service innovation and cost leadership. The insights and theoretical explanation developed in the prior discussions are then used to develop an RBL framework for practitioners to improve their logistics performance as explained in the following section.

8.5 Implication for Future Research

This study provides an appropriate framework for practitioners to manage and implement their RBL to achieve a positive and greater impact on customer service innovation and cost leadership advantage. Based on the major findings of this research frameworks for managing RBL in Figure 8.1 and 8.2 are suggested. As indicated in Figure 8.1, physical, relational and management expertise resources are antecedents to organizational resources and technology resources, which have a positive influence on customer service innovation. In terms of cost leadership, technology, physical and relational resources are antecedents to organizational and management expertise resources, which have a positive influence on cost leadership (Figure 8.2). The antecedents of organizational, management expertise and technology resources may directly influence customer service innovation and cost leadership.

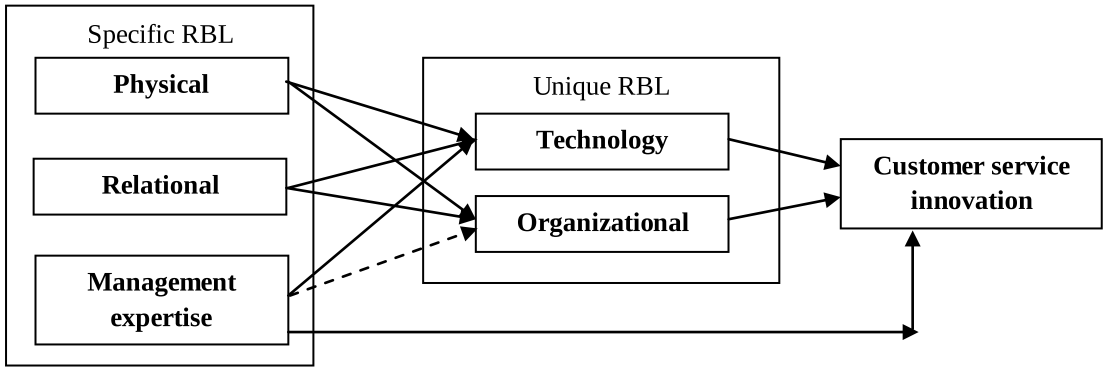


Figure 8.1: Resource-based logistics model for CSI

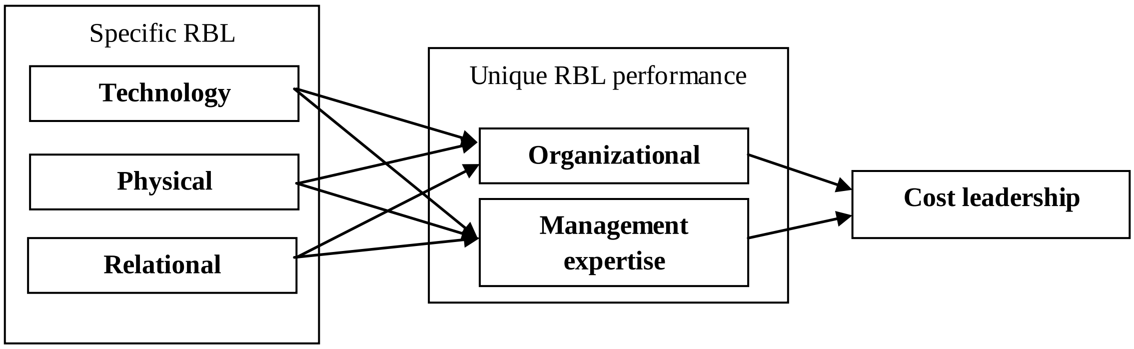


Figure 8.2: Resource-based logistics model for CL

The LSPs' superior logistics performance mainly derives from their unique organizational, management expertise and technology resources. Such unique resources can be enhanced by the acquisition of firm-specific resources such as technology and physical resources. Such firm-specific resources may not have a direct impact on logistics performance but their existence is crucial for unique resources to enhance their performance impacts. This is consistent with strategic literature that a firm's capability relies on a firm's resources such as technology and relational resources to generate superior performance (Porter, 1991; Makadok, 2001; Ray et al., 2004). In other words, logistics companies with great capabilities will not generate economic profit if they fail to acquire firm-specific RBL. The results also support Penrose's (1959) view that resources yield firm performance but superior performance is achieved when the value of resources is maximized through the development of capabilities to firm-specific resources.

The above RBL model can be applied by LSPs to achieve customer service innovation and cost leadership. First, LSPs should broadly acquire the five RBL namely technology, physical, management expertise, relational and organizational resources. These specific RBL are crucial for LSPs to support operations and business processes to increase customer service innovation and cost leadership. Second, LSPs should emphasize the unique resources and capabilities that lead to greatest customer service innovation and cost leadership. This research suggests that organizational, management expertise resource and technology resources are unique resources and capabilities for LSPs. Therefore LSPs should develop extensive levels of organizational resources to achieve service innovation and cost leadership by committing to trust and constant communication and interaction among business partners, focused on customer needs and requirements and providing solutions to customers. Further, LSPs should acquire multi-experienced staff, knowledgeable and skilled workers. These management expertise resources are essential for LSPs to achieve cost leadership. Furthermore LSP service efficiency can be achieved if LSPs acquire a high level of technology resources such as advanced information and web-based systems applications.

Third, LSPs should bundle both technology and organizational resources to achieve superior customer service innovation and management expertise and organizational resources to achieve superior cost leadership. LSPs' experienced staff and advanced technology equipment and facilities require organizational resources to execute an LSP's strategy and objectives on understanding customer needs and requirements. Fourth, LSPs should require logistics and IT infrastructures and collaborative relationships among business partners as fundamental resources to support logistics and business processes. Finally, LSPs should continuously adapt and improve technology, physical, management expertise, relational and organizational resources to protect their position from competitors. The high level of physical, relational and management expertise resources are complementary resources of organizational and technology resources to achieve customer service innovation while those high levels of technology, physical and relational resources are complementary resources of organizational and management expertise resources to achieve cost leadership. In addition, these complementary resources are negligible if LSPs do not acquire high levels of organizational resources.

8.6 Summary

The chapter discussed and explained the main results of this research. Particularly, the research found that the tangible and intangible elements of RBL have significant direct, bundling and mediation effects on logistics performance in term of customer service innovation and cost leadership. Specifically the five RBL (technology, physical, relational, management expertise and organizational resources) are found to be the determinants of logistics performance for Malaysian LSPs. Interestingly, their effects on performance vary. Furthermore, it is found that certain RBL bundling determines superior logistics performance. These effects occur due to the abilities of LSP-unique RBL (organizational, management expertise and technology resources) to mediate the relationships between firm-specific RBL and logistics performance. It is argued that the LSPs' unique RBL are more likely to become sources of SCA than LSP specific RBL which are more likely to become the sources of temporary competitive advantage. Therefore LSPs should focus on developing appropriate resource strategies to achieve superior logistics performance and sustainable competitive advantage.

The discussions on the above results are able to provide sufficient evidence to satisfactory answers to the six research questions set out at the beginning of the study. The contributions of this research to the theory and practices, taking into account the limitations of the research and how they can set the directions for future research, are discussed fully in the following chapter.

CHAPTER 9: CONCLUSION

9.1 Introduction

Based upon the preceding discussion of the findings this chapter presents a summary of main findings, contribution to theory, empirical evidence, and practice, and ends with the limitation of study that paves the way for future research.

9.2 Summary of the Main Findings

This research explores and provides insight into the nature of logistics resources acquired by Malaysian logistics service providers (LSPs) to achieve logistics performance. This research draws theoretical foundations from the relevant logistics literature, resource-based view (RBV) theory, human and organizational capital theory and interviews with managers of logistics companies to identify and establish constructs and measurements of resource-based logistics (RBL) and logistics performance. The research identifies five idiosyncratic resources for LSPs, that is, the technology, physical, relational, management expertise and organizational resources. Such LSP specific RBL are positively related to customer service innovation and cost leadership. However, the performance impact of RBL varies. Different resources and capabilities have different predictive abilities on customer service innovation and cost leadership.

The results recognize organizational resources as the most critical resources for LSPs to generate competitive advantage, which can be bundled with other resources to achieve sustainable competitive advantage. More specifically, the results suggest that organizational resources can be bundled with especially advanced technology resources to enhance customer service innovation and organization resources can be bundled with management expertise resources to enhance cost leadership. These unique RBL bundles are more likely to become the sources of sustainable competitive advantage.

It is discovered that unique bundles of RBL mediate the relationship between resources and logistics performance. In other words, some LSP resources and capabilities do not directly affect customer service innovation and cost leadership but they must, through unique resources, enhance customer service innovation and cost leadership. The results of this research recognize physical, management expertise and relational resources as antecedences to support organizational and technology resources to enhance customer service innovation. LSPs require technology, physical and relational resources as antecedences to support organizational, and management expertise resources to enhance cost leadership.

9.3 Contribution to Theory and Practice

9.3.1 Theory

9.3.1.1 Construct development and measurement

This research contributes to logistics literature in terms of the definition of RBL and the development and measurement of the constructs of RBL and logistics performance from the LSP perspective. This is a valuable contribution because previous logistics literature rarely formally develops such constructs and measurements from the LSP perspective based on strong theoretical foundations. The research contributes to the development of resource-based view (RBV) theory which supports resource-based expectations in general. Specifically the RBL constructs are consistent with the resource-based view expectation which divides resources into tangible and intangible resources.

9.3.1.2 Performance implications of RBL

This research provides theory-driven empirical evidence to explain the performance of LSPs. The research represents some of the novel advancement in understanding LSP specific RBL from the LSP perspective, unlike the majority of other logistics studies which look at individual resources from the user perspective. More significantly, this research uncovers the direct, bundling and mediation effects of RBL on customer service innovation and cost leadership. Previous logistics literature suggests and tests the direct relationships between some resources and logistic performance; whereas, this research is the first to examine the bundling and mediation effects of logistic resources.

The results of direct effects suggest that resources and capabilities such as technology, physical, management expertise, relational and organizational resources are the determinants of customer service innovation and cost leadership of LSPs. As a conclusion, RBL (LSP specific resources and capabilities) are necessary and important to enhance customer service innovation and cost leadership of LSPs.

9.3.1.3 Bundling and mediation effects

Even though the strategy literature has argued for the needs for bundling different resources there is no detail about what bundles of different resources are required for enhancing customer service innovation and cost leadership and sustainable competitive advantage, especially for LSPs. The results of bundling effects suggest that organizational, management expertise and technology resources have a unique effect on LSP performance. This research suggests that organizational resources are the most critical for LSP performance and management expertise resources are essential for LSP cost efficiency and technology resources are essential for service innovation.

The mediation effects uncovered by this research will, potentially, enhance the understanding of the relationships among RBL. The results suggest that organizational, management expertise and advanced technology resources are significant mediators of the relationships between other resources and logistics performance. This research suggests that organizational, management expertise and technology resources are most likely to be the sources of sustainable competitive advantage than physical and relational resources which are more likely to be the sources of temporary competitive advantage.

This research recognizes the importance of LSP specific and unique RBL for LSP logistics performance. The unique RBL, acting as mediators, have greater impact on customer service innovation and cost leadership than acting independently as firm-specific resources. The concept of resource bundle theory should not be limited to the bundling of all resources and capabilities but that bundling of different RBL to an appropriate extent would lead to superior customer service innovation and cost advantage. Another insight is that the resource and capability-based theory should not be limited to a focus on intangible resource, but it can be extended to the bundling of other tangible and intangible resources and capabilities. The major contribution of this research to theory is that with a strong empirical foundation, this research reveals that an additional impact on performance is generated from the bundling of appropriate resources and capabilities of LSPs.

9.3.1.4 Contribution to existing theory

This research confirms the value of the human and organizational capital theory to explain the performance impacts of management expertise and organizational resources and capabilities. Management expertise and organizational resources are unique, path-dependent and socially complex which are difficult to be imitated and substituted. Within the scope of RBV theory this research contributes to resource and dynamic capability theory which focuses on the contingencies approach for logistics resources conceptualization such as continual improvement and adaptation in technology, management and organizational resources and capabilities.

The research further supports RBV theory which posits that idiosyncratic resources and capabilities (valuable, rare, inimitable and non-transferable) are the determinants of performance. Further, this research contributes to the development of resource and capability theory which posits that resources alone may be valuable and rare but when they are bundled together they become inimitable and non-transferable, leading to greater and superior customer service innovation and cost leadership. This research contributes to the logistics and strategy literature that superior performance is dependent on how firms bundle their productive resources and capabilities (bundled with unique resources). The research also supports the resource and capability theory that unique resources are more likely to be sources of sustainable competitive advantage.

9.3.2 Empirical evidence

The results of this research provide empirical evidence to the logistics and strategy literature. This research develops constructs and measurements of RBL and logistics performance from the LSP perspective based on strong theoretical and empirical foundations. This research also provides much needed empirical evidence of the relationships between RBL and logistics performance.

The novel findings of this research are the empirical evidence on the direct, bundling and mediation effects of RBL on customer service innovation and cost leadership.

1. The research indicates that technology, physical, management expertise, relational and organizational resources are positively related to customer service innovation and cost leadership.

2. The bundling of organizational and technology resources is found to have positively and significantly enhanced customer service innovation. The bundling of organizational and management expertise resources is found to have positively and significantly enhanced cost leadership. Such bundling effects have never before been studied empirically.
3. The empirical evidence of this research suggests that organizational and technology resources are the significant mediators for the relationships between physical, management expertise and relational resources and customer service innovation. Physical and relational resources have no direct effect on customer service. However, management expertise resources can have dual effects which have direct and indirect effects on customer service innovation. Again, such detailed understanding of the relationships among logistics resources and performance has never before been studied.
4. The empirical evidence of this research indicates that organizational and management expertise resources are the significant mediators for the relationships between technology, physical and relational resources and cost leadership. The technology, physical and relational resources have no direct effect on cost leadership. Again, such detailed understanding of the relationships among logistics resources and performance, as far as the author is aware, has never been studied before.

9.3.3 Contribution to practice

The findings, therefore, carry significant practical implications for logistics managers. The findings provide indications for the effective ways to manage and harness RBL actively to create innovation capability in logistics. This research allows LSP managers to identify certain RBL as their strategic resources. Based on the results of this research, LSP managers are provided with the following insights:

(i) LSPs should focus on developing capabilities in the five RBL. Logistics managers should develop advanced equipment and technology, the ability to adapt and innovate in technology and physical, management expertise, relational and organizational resources to meet with customer demands and cost efficiency for unpredictable changes.

(ii) The five RBL are essential in enhancing LSP logistics performance. However LSPs will face more challenges and opportunities in the decade ahead as in future most LSPs are maturing and they already have most of the resources and capabilities in place. Since everyone is at the same level and certain resources are less costly to imitate, LSPs need to be able to distinguish firm-specific resources from unique resources. The results recognize that firm-specific physical and relational resource attributes are easy to imitate but unique resources such as organizational, management expertise and advanced technology resources are more difficult to imitate.

(iii) Organizational resources are the most important capability for LSPs to execute and implement strategies and objectives of LSPs into practices and routines to achieve innovative service and cost efficiency. Therefore LSPs should focus on developing their organizational resources and protecting such resource attributes because the development of organizational resources are subjected to time compression diseconomies, causal ambiguity and are socially complex. Organizational resources are the most critical resources for LSPs to generate competitive advantage because they are difficult to imitate by other players.

(iv) More specifically, LSPs should focus on bundling unique resources and capabilities to enhance their superior performance. Logistics managers should bundle organizational resources with technology resources to enhance their customer service innovation while organizational resources can be bundled with management expertise resources to enhance their cost leadership. LSPs acquire technology resources for their effective interaction and communication for transmitting and processing all information regarding inventory, production and shipping schedules. LSPs also acquire management expertise resources for developing their organizational resources and capabilities and for the effective use of technology and physical resources. Management expertise and technology resources play very important roles in the effort to increase world-wide competitive advantage. These unique resources and capabilities are difficult to imitate and likely to provide sustainable competitive advantage for LSPs.

(v) This research provides logistics managers with the RBL models leading to appropriate direction and managing RBL to generate LSP competitive advantage. LSPs should acquire physical, management expertise and relational resources to support their organizational and technology resources to enhance LSP customer service innovation advantage. LSPs should also acquire different resources and capabilities such as technology, physical and relational resources to support their organizational and management expertise resources in enhancing LSP cost leadership advantage. LSPs need a high level of organizational resources to enhance their customer service innovation and cost leadership. Furthermore, LSPs should develop a high level of management expertise resources in order to enhance their customer service innovation and cost leadership. For technology resources to enhance customer service innovation LSPs should acquire extensive physical, management expertise and relational resources.

9.4 Recommendation for Future Research

This study provides novel and key insight into the relationships between RBL and logistics performance. Although this study has revealed the robust results suggested that the RBL model has significant power to explain Malaysian LSPs' logistics performance, it would be interesting to identify if and how this impact would be in a different context in terms of country, time and industry. As such the researcher makes several recommendations to expand the scope of this study to reveal further insight into the relationship between the five RBL and logistics performance.

(i) The current study has been conducted within a Malaysian context. But it would be interesting to search if/how this study would be impact in developed economy or/and other industries to provide a cross-case comparison.

(ii) A longitudinal study would be conducted to examine the causal relationship between RBL and LSPs' performance.

(iii) The impact factors of LSPs' performance such as different operations and marketing strategies e.g. positioning and orientation strategies could be conducted to broaden the scope of the study.

(iv) The post-hoc analyses reveal key insight into the bundling of RBL and how LSPs should manage their resources and capabilities and further provide interesting framework for future research.

9.5 Summary

The findings of this research have important implications for the RBV theory of the firm and management practices. It presents an attempt to move from a fragmented view of RBL to more mature and empirically tested definitions and measurements of the constructs. The results are particularly encouraging: they strongly support the impacts of the five RBL on logistics performance. In addition, this research represents the first empirical examination of the bundling and combined effects of RBL. The new insights of this research are that even though RBL are positively correlated with logistics performance, their performance impacts can be enhanced by unique combinations of technology, management expertise and organizational resources. It is suggested that the framework and the results proposed in this study should stimulate new resource and capability-based research on the contextual determinants of LSP performance.

REFERENCES

A

Africk, J. M., & Calkins, C. S. (1994). Does asset ownership mean better service? *Transportation and Distribution , 35* (5), 49-61.

Aldin, N., Brehmer, P. O., & Johansson, A. (2004). Business development with electronic commerce: refinement and repositioning. *Business Process Management Journal* , 10(1)44-62.

Alshawi, S. (2001). Logistics in the internet age: towards a holistics information and processes picture. *Logistics Information Management , 14* (4), 235-241.

Amit, R., & Schoemaker, P. J. (1993). Strategic assets and organizational rent. *Strategic Management Journal , 14,* 33-46.

Amstrong, J. S., & Overton, T. S. (1977). Estimating non-response bias in mail surveys. *Journal of Marketing Research , 14* (3), 396-402.

Armstrong, C. E., & Shimizu, K. (2007). A review of approaches to empirical research on the resource-based view of the firm. *Journal of Management , 33* (6), 959-985.

B

Bakos, J. Y., & Treacy, M. E. (1986). Information technology and corporate strategy: a research perspective. *MIS Quaterly , 10* (2), 107-119.

Ballou, R. H. (2004). *Business Logistics/Supply Chain Management.* New Jersey: Prentice Hall.

Barlett, M. S. (1954). A note on the multiplying factors for various chi square approximations. *Journal of the Royal Statistical Society , 16* (Series B), 296-298.

Barney, J. B. (2001). Is the resource-based "view" a useful perspective for strategic management research? Yes. *The Academy of Management Review , 26* (1), 41-56.

Barney, J. B. (1986). Strategic factor markets: expectation, luck, business strategy. *Management Secience , 32* (10), 1231-1241.

Barney, J. B., & Clark, D. N. (2007). *Resource-Based Theory: Creating and Sustaining Competitve Advantage.* Oxford: University Press.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management , 17* (1), 99-120.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology , 51* (6), 1173-1182.

Bates, K. A., & Flynn, E. J. (1995). Innovation history and competitve advantage: A resource-based view analysis of manufactuirng technology innovations. *Academy of Management Journal* , 235-239.

Becker, G. S. (1964). *Human capital.* New York: Columbia.

Bharadwaj, A. S. (2000). A resource-based perspective on information technology capability and firm performance: An emprical investigation. *MIS Quaterly , 24* (1), 169-196.

Bowerman, B. L., & O'Connell, R. T. (1990). *Linear Statistics Models: An Applied Approach* (2nd ed.). Belmont CA: Duxbury.

Bowersox, D. J., & Daugherty, P. J. (1995). Logistics paradigms: the impact of information technology. *Journal of Business Logisitcs , 16* (1), 65-80.

Bowersox, D. J., Closs, D. J., & Cooper, M. B. (2007). *Supply Chain Logistics Management* (Second ed.). New York: McGraw Hill.

Brah, S. A., & Lim, H. Y. (2006). The effect of technology and TQM on the performance of logistics companies. *International Journal of Physical Distribution & Logistics Management , 36* (3), 192-209.

Brewer, P. C., & Speh, T. W. (2000). Using the bakance score card to measure supply chain performance. *Journal of Business Logistics , 21* (1), 75-94.

Bryman, A., & Bell, E. (2007). *Business Research Methods* (2nd ed.). Oxford: Oxford University Press.

Burrell, G., & Morgan, G. (1979). *Sociological Paradigms and Organizational Analysis.* Aldershot: Ashgate Publishing.

C

Carpenter, M. A., Sanders, G., & Gregersen, H. B. (2001). Bundling human capital with organizational context: The impact of international assignment experience on multinational firm performance and CEO pay. *Academy of Management Journal , 44* (3), 493-511.

Cattle, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioral Research , 1*, 245-276.

Caves, R. E. (1980). Industrial organization, corporate strategy and structure. *Journal of Economic Literature , XVII*, 64-92.

Chapman, R. L., Claudine, S., & Kandampully, J. (2003). Innovation in logisitcs services and the new business model: A conceptual framework. *International Journal of Physical Distribution and Logisitcs Management , 33* (7), 630-650.

Charmaz, K. (2003). Qualitative Interviewing and Grounded Theory Analysis. In J. A. Holstein, & J. F. Gubrium, *Inside Interviewing: New Lenses, New Concerns* (pp. 311-328). Thousand Oaks: Sage Publication, Inc.

Chen, C. C. (2008). A model for customer-focused objective-based performance evaluation of logisitcs service providers. *Asia Pacific Journal of Marketing and Logistics , 20* (3), 309-322.

Chen, I. J., & Paulraj, A. (2004). Towards a theory of supply chain management: The constructs and measurements. *Journal of Operations Management , 22* (2), 119-150.

Chiu, H. N. (1995). The integrated logistics management system: a framework and case study. *International Journal of Physical Distribution & Logistics Management , 25* (6), 4-19.

Churchill, G. J. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research , 16* (1), 64-73.

Closs, D. J., & Thompson, C. K. (1992). Logistics physical resource management. *Journal of Business Logistics , 13* (2), 269-283.

Closs, D. J., & Xu, K. (2000). Logistics information technology practices in manufactuirng and merchandising firms: An international benchmarking study versus world class logistics firms. *International Journal of Physical Distribution and Logistics Management , 30* (10), 869-886.

Closs, D. J., Goldsby, T. J., & Clinton, S. R. (1997). Information technology influences on world class logistics capability. *International Journal of Physical Distribution and Logistics , 27* (1), 4-17.

Collis, J., & Hussey, R. (2003). *Business Research: A practical guide for undergraduate and postgraduate students* (Second ed.). Macmillan, London.

Coyle, J. J., Bardi, E. J., & Langley, J. J. (2003). *The Management of Business Logistics - Supply Chain Perspective* (7th ed.). South - Western: Mason OH.

Coyle, J. J., Bardi, E. J., & Langley, J. J. (1996). *The Management of Business Logistics* (6 ed.). New York: West Publishing Company.

Creswell, J. W. (1994). *Research Design: Qualitative & Quantitative Approaches.* Thousand Oaks, CA: Sage Publications, Inc.

Cullinane, K., & Toy, N. (2000). Identifying influential attributes in freight route/mode choice decisions: a content analysis. *Transportation Research , Part E 36*, 41-53.

D

Daugherty, P. J., & Pittman, P. H. (1995). Utilization of time-based startegies: creating distribution flexibility/responsivenss. *International Journal of Operations & Production Management , 15* (2), 54-60.

Daugherty, P. J., Myers, M. B., & Autry, C. W. (1999). Automatic replenishment programs: An empirical examination. *Journal of Business Logistics , 20* (2), 63-82.

Daugherty, P. J., Stank, T. P., & Ellinger, A. E. (1998). Leveraging logisitcs/distribution capabilities: the effect of logistics service on market share. *Journal of Business Logisitcs , 16* (1), 23-41.

Davis, D. F., & Mentzer, J. T. (2008). Relational reosurce in interorganizational exchange: the effects of trade equity and brand equity. *Journal of Retailing , 84* (4), 435-448.

Day, G. S. (1994). The capabilities of market-driven organizations. *The Journal of Marketing , 58* (4), 37-52.

Delfmann, W., Albers, S., & Gehring, M. (2002). The impact of electronic commerce on logistics service providers. *International Journal of Physical Distribution and Logistics Management , 32* (3), 203-222.

Denzin, N. K., & Lincoln, Y. S. (1994). *Handbook of Qualitative Research.* Newbury Park, CA: Sage.

Dierickx, I., & Cool, K. (1989). Asset stock accumulation and sustainability of competitive advantage. *Management Science , 35* (12), 1504-1513.

Drew, S. A., & Smith, P. A. (1998). The new logistics management: Transportation through organizational learning. *International Journal of Physical Distribution and Logistics Management , 28* (9/10), 666-682.

Dunn, S. C., Seaker, R. F., & Waller, M. A. (1994). Latent variables in business logistics research: scale development and validation. *Journal of Business Logistics , 15* (2), 145-172.

E

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal , 21,* 1105-1121.

Edelman, L. F., Brush, C. G., & Manolova, T. (2005). Co-alignment in the resource - performance relationship: strategy as mediator. *Journal of Business Venturing , 20,* 359-383.

Ellinger, A. E., Ellinger, A. D., & Keller, S. B. (2002). Logistics managers' learning environments and firm performance. *Journal of Business Logistics , 23* (1), 19-37.

Ellinger, A. E., Ketchen, D. J., Hult, G. T., Elmadag, A. B., & Richey, R. G. (2008). Market orientation, employee development practices, and performance in logistics service provider firms. *Indusrtrial Marketing Management , 37,* 353-366.

F

Fabbe-Costes, N., Jahre, M., & Roussat, C. (2009). Supply chain integration: the role of logistics service providers. *International Journal of Productivity and Performance Management , 58* (1), 71-91.

Facanha, C., & Horvath, A. (2005). Environment assessment of logistics outsourcing. *Journal of Management in Engineering , 21* (1), 27-37.

Fawcett, S. E., & Cooper, M. B. (1998). Logistics performance measurement and customer success. *Industrial Marketing Journal , 27,* 341-357.

Field, A. (2009). *Discovering Statictics Using SPSS* (Third ed.). London: SAGE publication.

Forza, C. (1996). Achieving superior operating performance from integrated pipeline management: an empirical study. *International Journal of Physical Distribution & Logistics Management , 26* (9), 36-63.

Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counseling Psychology , 51* (1), 115-134.

G

Goffin, K., Szwejczewski, M., & New, C. (1997). Managing suppliers: when fewer can mean more. *international Journal of Phyiscal DIstribution & Logistics Management , 27* (7), 422-436.

Grant, D. B., Lambert, D. M., Stock, J. R., & Ellram, L. M. (2006). *Fundamantel of Logistics Management.* New York: McGraw - Hill.

Grant, R. M. (1991). The resource-based theory of competitive advantage. *California Management Review , 33* (3), 114-135.

Grant, R.M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal,* 17, 109-122.

Green, S. B. (1991). How many subjects does it take to do a regression analysis? *Multivariate Behavioral Research , 26,* 499-510.

Gummesson, E. (2000). *Qualitative Methods in Management Research, 2nd ed.* London: Sage Publications.

Gunasekaran, A., & Ngai, E. W. (2003). The successful management of a small logistics company. *International Journal of Physical Distribution & Logistics Management , 33* (9), 825-842.

H

Hafeez, K., Zhang, Y., & Malak, N. (2002). Determining key capabilities of a firm using analytic hierarchy process. *International Journal of Production Economics , 76*, 39-51.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate Data Analysis* (5th ed.). New Jersey: Prentice Hall.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis* (seventh ed.). New Jersey: Pearson Prentice Hall.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis* (6th ed.). Upper Saddle River, NJ: Pearson Education.

Hammant, J. (1995). Information technology trends in logistics. *Logistics Information Management , 8* (6), 32-37.

Helfat, C. E., & Peteraf, M. A. (2003). The dynamic resource-based view: Capability lifecycles. *Strategic Management Journal , 24*, 997-1010.

Helfat, C. (2000). Guest editor's introduction to the special issue: the evaluation of firm capabilities. *Startegic Management Journal , 21* (10-11), 955-960.

Hertz, S., & Alfredsson, M. (2003). Strategic development of third party logisitcs providers. *Industrial Marketing Management , 32* (2), 139-149.

Hesket, L., James, J., & Nicholas, A. (1973). *Business logisitcs, physical distribution and materials management*. The Ronald Press Company.

Hofer, C. W., & Schendel, D. (1978). *Strategy Formulation: Analytical Concepts*. St. Paul MN: West Publishing.

Hoopes, D. G., Madsen, T. L., & Walker, G. (2003). Guest editor introduction to the special issue: Why is there a resoruce-based view? Toward a theory of compettive heterogeneity. *Strategic Management Journal , 24*, 889-902.

House, R. G., & Stank, T. P. (2001). Insight from a logistics partnership. *Supply Chain Management: An International Journal , 6* (1), 16-20.

Huang, S. M., Ou, C. S., Chen, C. M., & Lin, B. (2006). An empirical study of relationship between IT investment and firm performance: A resource-based perspective. *European Journal of Operation Research , 173*, 984-999.

Hunt, S. D. (2001). Commentary - a general theory of competition: issues, answer and an invitation. *European Journal of Marketing , 35* (5/6), 524-548.

Hunt, S. D. (1997). Competing through relationships: Grounding relationship marketing in resource-advantage theory. *Journal of Marketing Management , 13* (5), 431-445.

Hunt, S. D., & Morgan, R. M. (1995). The comparative advantage theory of competition. *Journal of Marketing , 59* (2), 1-15.

Huselid, M., Jackson, S., & Schuler, R. (1997). Technical and strategic human resource management effectiveness as determinants of firm performance. *Academy of Management Journal , 40*, 171-188.

Hussey, J., & Hussey, R. (1997). *Business Research: A Practical Guide for Undergraduate and Postgraduate*. London: Macmillan Press.

Hutcheson, G., & Sofroniou, N. (1999). *The multivariate social scientist.* London: Sage.

I

Itami, H. (1987). *Mobilizing invisible assets.* Cambridge, MA: University Press.

K

Kahn, K. B., & Mentzer, J. T. (1998). Marketing's integration with other departments. *Journal of Business Research , 42*, 53-62.

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika , 39*, 31-36.

Kandampully, J. (2002). Innovation as the core competency of a service organization: the role of technology, knowledge and networks. *European Journal of Innovation Management , 5* (1).

Karia, N., & Razak, R. C. (2007). Logistics Assets That Payoff Competitive Advantage. In K. S. Soliman, *Information Management in the Networked Economy: Issues & Solutions* (pp. 33-39). New York: International Business Information Mangement Association.

Kearns, G. S., & Lederer, A. L. (2003). A resource-based view of strategic IT allignment: how knowledge sharing creates competitive advantage. *Decision Science , 34* (1), 1-29.

Ketokivi, M., & Schroeder, R. (2004). Manufacturing practices, strategaic fit and performance. *International Journal of Operations and Production Management , 24* (2), 171-191.

Knemeyer, A. M., & Murphy, P. R. (2004). Evaluating the performance of third-party logistics arrangement: a relationship marketing perspective. *Journal of Supply Chain Management , 40* (1), 35-51.

Kovacs, G., & Spens, K. M. (2005). Abductive reasoning in logistics research. *International Journal of Physical Distribution & Logistics Management , 2*, 132-144.

Krippendorff, K. (1980). *Content Analysis: An Introduction to its Methodology*. Newbury Park CA: Sage.

Kuk, G. (2004). Effectiveness of vendor-managed inventory in the eletronics industry: determinants and outcomes. *Information and Management , 41*, 645-654.

L

La Londe, B. J., & Master, J. M. (1994). Emerging logistics strategies: blueprints for the next century. *International Journal of Physical Distribution & Logistics Management , 24* (7), 35-47.

Lado, A., & Wilson, M. (1994). Human resource system and sustained competitved advantage: A competency-based perspective. *Academy of Management Review , 19*, 699-727.

Lai, F., Li, D., Wang, Q., & Zhao, X. (2008). The information technology capability of third-party logistics providers: A resource-based view and empirical evidence from China. *Journal of Supply Chain Management , 44* (3), 22-38.

Lai, F., Zhao, X., & Wang, Q. (2006). The impact of information technology on the competitve advantage of logisitcs firms in China. *Industrial Management and Data System , 106* (9), 1249-1271.

Lai, K. H., & Chen, T. C. (2003). Supply chain performance in transport logisitcs: an assessment by service providers. *International Journal of Logistics: Research and Application , 6* (3), 151-164.

Lai, K. H., Ngai, E. W., & Cheng, T. C. (2005). Information technology adoption in Hong Kong's logistics industry. *Transportation Journal , 44* (4), 1-9.

Lai, K. (2004). Service capability and performance of logistics service providers. *Transportation Research Part E , 40*, 385-399.

Lakhal, L., Pasin, P., & Limam, M. (2005). Quality managment practices and their impact on performance. *International Journal Of Quality and Relaibility Management , 23* (6), 625-646.

Langley, J., & Capgemini. (2007). The state of logisitcs outsourcing: 2007 third-party logistics. In *12th Anual study of third party*. Third Party Logistics.

Lappin, T. (1996). The airline of internet. *Wired , 4* (12), 234-241.

Larson, P. D., & Kulchitsky, J. D. (1999). Logistics improvement programs: the dynamics between people and performance. *International Journal of Physical Distribution & Logistics Management , 29* (2), 88-102.

Lieb, R., & Bentz, B. A. (2005). The use of third-party logistics services by large American manufacturers: the 2004 survey. *Transportation Journal , 44* (2), 5-15.

Likert, R. A. (1932). Technique in the measurement of attitudes. *Archives of Psychology , 140*, 1-55.

Lin, C.-Y. (2007). Factors affecting innovation in logistics technologies for logisitcs service providers in China. *Journal of Technology Management in China , 2* (1), 22-37.

Lin, C.-Y. (2008). Factors affecting the adoption of Radio frequency identification technology by logistics service providers: An empirical study. *International Journal of Management* , 488-593.

Lippman, S., & Rumelt, R. P. (1982). Uncertain imitability: An analyisis of interim differences in efficiency under competition. *Bell Journal of Economic , 13*, 418-438.

Lowson, R. H. (2003). How supply network operations strategies evolve: composition, competitive priorities and customisation. *International Journal of Physical Distribution & Logistics Management , 33* (1), 75-91.

M

MacKinnon, D. P., & Dwyer, J. H. (1993). Estimating mediated effects in prevention studies. *Evaluation Review , 17*, 144-158.

MacKinnon, D. P., Warsi, G., & Dwyer, J. H. (1995). A simulation study of mediated effects measures. *Multivariate Behavioral Research , 30* (1), 41-62.

Makadok, R. (2001). Toward a synthesis of the resource-based and dynamic-capability views of rent creation. *Strategic Management Journal , 22*, 387-401.

Mangan, J., & Christopher, M. (2005). Management development and the supply chain manager of teh future. *International Journal of Logistics Management , 16* (2), 178-191.

Mangan, J., Lalwani, C., & Gardner, B. (2004). Combining quantitative and qualitative methodologies in logistics research. *International Journal of Physical Distribution & Logistics Management* , 565-578 34(7).

Mayo, E. (1933). *The Human Problems of an Industrial Civilization.* New York: Mcmillan.

Mentzer, J. T., & Kahn, K. B. (1995). A framework of logistics research. *Journal of Business Logistics , 16* (1), 231-250.

Mentzer, J. T., Foggin, J. H., & Golicic, S. L. (2000). Collaboration: The enablers, impediments and benefits. *Supply Chain management Review , 4* (4), 52-58.

Mentzer, J. T., Min, S., & Bobbitt, L. M. (2004). Toward a unified theory of logistics. *International Journal of Physical Distribution & Logistics Management , 34* (8), 606-627.

Miles, J. N., & Shevlin, M. (2001). *Applying Regression and Correlation: A Guide for Students and Researchers.* London: Sage.

Miles, M. B., & Huberman, A. M. (1984). *Qualitative Data Analysis: A Sourcebook of of New Method* . Beverly Hills, CA: Sage Publications.

Miller, S. R., & Ross, A. D. (2003). An exploratory analysis of reosurce utilization across organizational units. *International Journal of Operations & Production Management , 23* (9), 1062-1083.

Min, S., Roath, A. S., & Daugherty, P. J. (2005). Supply chain collaboration: What's happening? *The International Journal of Logistics Management , 16* (2), 237-256.

Moberg, C. R., Cutler, B. D., Gross, A., & Speh, T. W. (2002). Identifying antecedents of informtaion exchange within supply chains. *international Journal of Physical Distribution and Logistics Management , 32* (9), 755-770.

Murphy Jr, P. R., & Wood, D. F. (2004). *Contemporary Logistics* (8th ed.). New Jersey: Prentice Hall.

Murphy, P. R., & Poist, R. F. (1994). Education strategies for succeeding in logistics: a comparative analysis. *Transportation Journal , 33*, 36-48.

Murphy, P. R., & Poist, R. F. (2006). Skill requirements of contemporary senior and entry - level logistics manager: a comparative analysis. *Transportation Journal , 45* (3), 46-60.

Murphy, P. R., & Poist, R. F. (2007). Skill requirements of senior - level logisticians: longitudinal assessment. *Supply Chain Management Journal: An International Journal , 12* (6), 423-431.

Murphy, P. R., & Poist, R. F. (1998). Skill requirements of senior-level logistician practitioner perspectives. *International Journal of Physical Distribution and Logistics Management , 28* (4), 284-301.

Murphy, P. R., & Poist, R. F. (2000). Third-party logistics: some user versus provider perspectives. *Journal of Business Logsitcs , 21* (1), 121-133.

Murphy, P., & Poist, R. (1991). Skill requirements of senior-level logisticcians: practitioner pespectives. *International Journal of Physical Distribution & Logistics Management , 21* (3), 3-14.

Myers, M. B., Fawcett, S. E., & Smith, S. R. (1996). Operating in the Caribbean: a logistics perspective. *International Journal of Physical Distribution & Logistics Management , 26* (9), 20-35.

Myers, M. B., Griffith, D. A., Daugherty, P. J., & Lusch, R. F. (2004). Maximizing the human capital equation in logistics: education, experience, and skill. *Journal of Business Logistics , 25* (1), 211-231.

Myers, R. (1990). *Classical and Modern Regression with Applications*. Boston MA: Duxbury.

N

Naslund, D. (2002). Logistics needs qualitative research: especially action research. *International Journal of Physical Distribution and Logistics Management* , 321-38 32(5).

Nelson, R. R., & Winter, S. G. (1982). *An evolutionary theory of economic change*. Cambridge MA: Harvard University Press.

Newbert, S. L. (2007). Empirical research on the resource - based view of the firm: an assessment and suggestions for future research. *Strategic Management Journal , 28*, 121-146.

Novack, R. A., Rinehart, L. M., & Wells, M. V. (1992). Rethinking concept foundations in logistics management. *Journal of Business Logistics , 13* (2), 233-267.

Nunnaly, J. C. (1978). *Psychometric Theory* (2nd ed.). New York: McGraw-Hill.

O

Okpara, J. O., & Wynn, P. (2008). Human resource management practices in transition economy: challenges and prospects. *Management Research News , 31* (1), 57-76.

Oladunjoye, G. T., & Onyeaso, G. (2007). Differences between resources and strategy in strategic management: an experimental investigation. *International Journal of Management , 24* (3), 592-604.

Olavarrieta, S., & Ellinger, A. E. (1997). Resource-based theory and strategic logistics reserach. *International Journal of Physical Distribution & Logistics Management , 27* (9/10), 559-587.

Olsen, W. (2004). Triangulation in social research: qualitative and quantitative methods can really be mixed. In M. H. Ormskirk, *Developments in Sociology*. Causeway Press.

P

Pallant, J. (2007). *Survival Manual. A step by step guide to data analysis using SPSS for windows* (3rd ed.). New York: McGraw Hill.

Panayides, P. M. (2007a). Effects of organizational learning in third-party logistics. *Journal of Business Logistics , 28* (2), 133-158.

Panayides, P. M. (2006). Enhancing innovation capability through relationship management and implications for performance. *European Journal of Innovation Management , 9* (4), 466-483.

Panayides, P. M. (2004). Logistics service providers: An empirical study of marketing strategies and company performance. *International Journal of Logistics: Research and Applications , 7* (1), 1-15.

Panayides, P. M. (2007b). The impact of organizational learning on relationship orientation, logistics service effectiveness and performance. *Industrial Marketing Management , 36*, 68-80.

Panayides, P. M., & So, M. (2005b). Logistics service provider-client relationship. *Transportation Research , Part E* (41), 179-200.

Panayides, P. M., & So, M. (2005a). The impact of integrated logistics relationships on third-party logistics serive quality and performance. *Maritime Economics & Logistics , 7*, 36-55.

Penrose, E. T. (1959). *The Theory of the Growth of the Firm*. New York: John Wiley.

Persson, G., & Virum, H. (2001). Growth strategies for logistics service provider: A case study. *International Journal of Logistics Management , 12* (1), 53-64.

Peters, T. J., & Waterman, R. H. (1982). *In Search of Excellence*. New York: Harper and Row.

Piplani, R., Pokharel, S., & Tan, A. (2004). Perspectives on the use of information technology at third party logistics service providers in Singapore. *Asia Pacific Journal of Marketing and Logistics , 16* (1), 27-41.

Poist, R. F., Scheraga, C. A., & Semeijn, J. (2001). Preparation of logistics managers for the contemporary environment of the European Union. *International Jouranl of Physical Distribution & Logistics Management , 31* (7/8), 487-504.

Porter, M. E. (1985). *Competitive Advantage*. Free Press, New York.

Porter, M. E. (1980). *Competitive Strategy*. New York: Free Press.

Porter, M. E. (1991). Towards a dynamic theory of strategy. *Strategic Management Journal , 12* (1), 95-117.

Porter, M. E., & Millar, V. E. (1985). How information gives you competitive advantage. *Harvard Business Review , 63* (4), 146-160.

Powell, T. C., & Dent-Micallef, A. (1997). Information technology as competitve advantage: the role of human, business, and technology resources. *Strategic Management Journal , 18* (5), 375-405.

Prahalad, C. K., & Hamel, G. (1990). The core competence of the corporation. *Harvard Business Review , 68*, 79-91.

Preacher, K. J. (2010). *Calculataion for the Sobel test: an interactive calculation tool for mediation tests.* http://people.ku.edu/-preacher/sobel/sobel.htm (accessed January 2011).

Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavioral Research Methods, Instruments & Computers , 36* (4), 717-731.

Priem, R. L., & Butler, J. E. (2001a). Is the resource-based view a useful perspective for strategic management research? *Academy of Management Review , 26* (1), 22-40.

Priem, R. L., & Butler, J. E. (2001b). Tautology in resource-based view and implication of externally determined resource value: Further comments. *Strategic Management Journal , 26* (1), 57-66.

Putlitz, J. Z., & Teissier, J. (May/June, 2007). The human factor. *Supply Chain Europe , 16* (3), pp. 42-45.

R

Ray, G., Barney, J. B., & Muhanna, W. A. (2004). Capabilities, business processes, and competitive advantage: Choosing the dependent variable in empirical tests of resource-based view. *Strategic Management Journal , 25*, 23-37.

Razzaque, M. A., & Sirat, M. S. (2001). Skill requirements: perseption of the senior Asian logisticians. *Internatioanl Jouranl of Physical Distribution & Logistics Management , 31* (5), 374-395.

Reed, R., & Defillippi, R. J. (1990). Causal ambiguity, barriers to imitation, and sustainable competitive advantage. *The Academic of Management Review , 15* (1), 88-102.

Reuber, R. (1997). Management experience and management expertise. *Decision Support System 21* , 51-60.

Rosenzweig, E. D., Roth, A. V., & Dean Jr, J. W. (2003). The influence of an integration strategy on competitive capabilities and business performance: An exploratory study of consumer products manufacturers. *Journal of Operations Management , 21*, 437-456.

Rubin, P. H. (1973). The expansion of firms. *Journal of Political Economy , 81* (4), 936-949.

Rumelt, R. P. (1984). Toward a strategic theory of the firm. In *Competitive Strategic Management* (Lamb RB ed.). Englewood Cliffs, NJ: Prentice-Hall.

S

Sachan, A., & Datta, S. (2005). Review of supply chain management and logistics research. *International Journal of Physical Distribution & Logistics Management , 35* (9), 664-705.

Sanders, N. R., & Premus, R. (2005). Modeling the relationship between firm IT capability, collaboration and performance. *Journal of Business Logistics , 26* (1), 1-23.

Saunders, M., Lewis, P., & Thornhill, A. (2003). *Research Methods for Business Students* (3rd ed.). London: Financial Times Prentice Hall.

Schulze, W. S. (1994). The two shools of thought in reosurce-based theroy: definitions and implications for research. In P. Shrivastava, A. S. Huff, J. E. Dutton, P. Shrivastava, A. S. Huff, & J. E. Dutton (Eds.), *Advances in Strategic Management* (Vol. 10 A). Greenwich CT: JAI Press.

Sekaran, U. (2003). *Research Methods for Business: A Skill-building Approach* (4rd ed.). New York: Joh Wiley & Sons.

Shang, K. c., & Marlow, P. B. (2005). Logistics capabilities and performance in Taiwan's major manufactuirng firms. *Transportation Research Part E , 41*, 217-234.

Sheffi, Y. (1990). Third party logistics: present and future prospects. *Journal of Business Logistics , 11* (2), 27-39.

Silveira, G. J., & Arkader, R. (2007). The direct and mediated relationship between supply chain coordination investments and delivery performance. *International Journal of Operations and Production Management , 27* (2), 140-158.

Sink, H. L., Langley, C. J., & Gibson, B. J. (1996). Buyer observations of the US third-party logistics market. *International Journal of Physical Distribution & Logistics Management , 26* (3), 38-46.

Sinkovics, R. R., & Roath, A. S. (2004). Strategy orientation, capabilities, and performance in manufacturer - 3PL relationship. *Journal of Business Logistics , 25* (2), 46-64.

Skjoett-Larsen, T. (1999). Supply chain management: a new challenge for reseachers and managers in logisitcs. *The international Journal of Logistics Management , 10* (2), 41-53.

Skjoett-Larsen, T. (2000). Third party logistics - from an interorganizational point of view. *International Jpurnal of Physical Distribution & Logistics Management , 30* (2), 112-127.

Sobel, M. E. (1982). Asymptotic intervals for indirect effects in structural equations models. In S. Leinhart (Ed.), *Sociology methodology 1982* (pp. 290-312). San Francisco: Jossey-Bass.

Stainer, A. (1997). Logistics - a productivity and performance perspective. *Supply Chain Management: An International Journal , 2* (2), 53-62.

Stank, T. P., Goldsby, T. J., Vickery, S. K., & Savitskie, K. (2003). Logistics service performance: estimating its influence on market share. *Journal of Business Logistics , 24* (1), 27-55.

Stefansson, G. (2006). Collaborative logistics management and the role of third-party service providers. *International Journal of Physical Distribution & Logistics Management , 36* (2), 76-92.

Stevens, J. P. (2002). *Applied Multivariate Statistics for Social Sciences*. Hillsdale NJ: Erlbaum.

Stock, J. R. (1997). Applying theories from other disciplines to logistics. *International Journal of Physical Distribution & Logistics , 27* (9/10), 515-539.

Stock, J. R. (1990). Logistics thought and practice: a perspective. *International Journal of Physical Distribution and Logistics Management , 20* (4), 3-6.

T

Tabachnik, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston: Allyn & Bacon.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dyanmic capabilities and strategic management. *Strategic Management Journal , 18* (7), 509-533.

Tomer, J. F. (1987). *Organizational capital: Time path to higher productivity and well-being*. New York: Praeger.

V

Vaidyanathan, G. (January, 2005). A framework for evaluating third-party logistics. *Communication of The ACM , 48* (1), pp. 89-94.

W

Walker, W. (2005). The strengths and weaknesses of research designs involving quantitative measures. *Journal of Research in Nursing , 10* (5), 571-582.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal , 5* (2), 171-180.

Wernerfelt, B. (1995). The resource-based view of the firm: Ten years after. *Strategic Management Journal , 16* (3), 171-174.

Wilding, R., & Juriado, R. (2004). Customer perceptions on logistics outsourcing in the European consumer good industry. *International Journal of Physical Distribution & Logistics Management , 34* (8), 628-644.

Winter, S. G. (1995). Four 'r's of profitability: rents, resources, routines and replication. In C. A. Montgomery (Ed.), *Resource-Based and Evalutionary Theories of the Firm: Toward a Synthesis*. Norwell, MA: Kluwer Academic Publishers.

Wiseman, C. (1988). *Strategic Information System*. Homewood IL: Irwin.

Wong, C. Y., & Karia, N. (2010). Explaining the competitve advantage of logistics providers: A resource-based view approach. *International Journal of Production Economics , 128*, 51-67.

Wouters, M., & Sportel, M. (2005). The role of existing measures in developing and implementing performance measurement systems. *International Journal of Operations & Production Management , 25* (11), 1062-1082.

Wright, P. M., McMahan, G. C., & McWilliams, A. (1994). Human resources and sustained competitve advantage: A resource-based perspective. *International Journal of Human Resources Management , 5*, 301-326.

Wright, P. M., Smart, D., & McMahan, G. C. (1995). Matches between human resources and strategy among NCAA basket ball teams. *Academy of Management Journal , 38*, 1052-1074.

Wu, F., Yeniyurt, S., Kim, D., & Cavusgil, T. S. (2006). The impact of information technology on supply chain capabilities and firm performance: A resource-based view. *Industrial Marketing Management , 35*, 493-504.

Y

Yang, C. C., Marlow, P. B., & Lu, C. S. (2009). Assessing resources, logistics service capabilities, innovation capabilities and the performance of container shipping service in Taiwan. *International Journal of Production Economics , 122*, 4-20.

Yeung, J. H., Selen, W., Sum, C., & Huo, B. (2006). Linking financial performance to strategic orientation and operational priorities: an empirical study of third-party logistics providers. *International Journal of Physical Distribution and Logistics Management* , *36* (3), 210-230.

Yin, R. K. (2003). *Case Study Research: Design and Method*. Thousand Oaks, CA: Sage Publications, Inc.

Yin, R. K. (1994). *Case study research: Design and methods*. London: Sage Publication.

Youndt, M. A., Snell, S. A., Dean, J. W., & Lepak, D. P. (1996). Human resource management, manufacturing strategy, and firm performance. *Academy of Management Journal* , *39* (4), 836-866.

Z

Zineldin, M. (2004). Total relationship and logistics management. *international Journal of Physical Distribution & Logistics Management* , *34* (3/4), 286-301.

APPENDICES

Appendix A: Field work diary

Date	Contact Name	Company	Action
2nd Feb			Arrival time 10.30am at Penang Airport. Not feeling well, running nose and cough. Might be due to weather changes from low to high degree, cold to warm country (Malaysia)
3rd Feb			Settle personnel matter. Start working tomorrow.
4th Feb	Che Anie Azmi	Former Section Head at Manufacturing Company Assistant Manager for Logistics Department	Call Che Anie for discussion: Looking contact for logistics managers. She is employed to search for contacts within two months before the researcher coming back to Malaysia. Call Mr. Azmi for discussion: Given and introduced researcher to LSPs. The researcher contacted him via email to request for contacts at December 2008.
5th Feb	Mr. A Mr. B and Mr BB		Call him from UK immediately after get contact. Call for interview – agree to meet on 6th Feb at 4.00pm. Call for interview – meeting on 11/2/09 at 10am and above
6th Feb	***Mr. A*** Mr. C and Mr. CC	***Assistant Manager of Shipping Company – Company A***	***Interviewed 4.00pm to 4.30pm***. Arrange appointment with others contact via Email: Agreed to meet on 12/2/09
11th Feb	***Mr. B and Mr.BB*** Mrs. E Mr. G	***Director of Local Forwarding Logistics – Company B*** Logistics Company	***Interviewing at their office at 10.45am to 1pm.*** Agreed to meet on Friday 13th Feb, by 3pm Got new contact number. Call for interview, but requested to call after two weeks as he is not in.
12th Feb	***Mr. C and Mr. CC***	***Freight Forwarders – Company C***	***Interviewing at 11am to 1pm***.
13th Feb			Unable to meet Mrs. E due to unforeseen event. Arrange to meet next Thursday at 10am, 19th Feb.
16th Feb			Make phone call via contacts given. Call Mr. D and Mr. F for appointment. Mr D agreed to meet on 18th Feb and Mr. F on 25th Feb.
18th Feb	***Mr. D***	***Integrated Logistics – Company D***	***Interviewed at 4.45pm to 6pm***.
19th Feb	***Mrs. E***	***Freight Service – Company E***	***Interviewed at 10.45am to 12.30pm***
25th Feb	***Mr. F***	***Company F***	***Interviewed at his office at 10.00am***
26th Feb	Mr. G and Mr. H		Promise to meet at Mr. G's place by 3rd March at 9.30 am.
3rd March	***Mr. G***	***Logistics Company - Company G***	***Interview Mr. G at his office by 9.30 am,*** Mr. H was unable to come due to his medical leave Providing me with Malaysia Logistics Directory (hardcopy)

Appendix B: Summary of data on resources acquired

LSP	Resources	Level	Summary of data extracted from transcribing interviews
Company A	Physical	High	Needs specialized equipments and maintenances
	Technology	Medium	Technology and innovation tend to make shipping easier and more practical
	Management Expertise	Medium	Study need to encompass all shipping and logistics as well as technology to be able to cope with demand and future shipment
	Relational	Low	Not mentioned
	Organizational	Low	Not mentioned
Company B	Physical	Medium	"We provide transportation and leased some warehouses from our vendors”
	Technology	Medium	“documents and transaction through emails...employed EDI in 2005”
	Management Expertise	Low	“not necessary to have degree, We can train workers to logistics operations if they don’t have any experience, skill or knowledge
	Relational	High	“we have established these relationship...most important is to have good communication with clients”
	Organizational	Medium	“For us they are always right...we understand their requirement”
Company C	Physical	Medium	“We don’t have to own or to be assets-based. We have our own vendors”
	Technology	Medium	“We are not done yet on technology wise...., at least we have basic system”.
	Management Expertise	High	“People do hire you because of how much experiences do we have, what we have done in the previous company”.
	Relational	High	“Establish contact, expand your logistics network. Within the network they build up the relationship.”
	Organizational	Medium	“We have focused on customer.... more flexible to customer’s need..... and able to meet their needs”
Company D	Physical	High	“We are assets-based (container yards 6-6 acres = 2000 TEU) warehousing and haulage”
	Technology	Medium	“Computer system and tools for communication such as email, internet.
	Management Expertise	High	“Recognized as heavy with upper and middle managers - set of people with multitasking and skills. Everyone knows to run each unit”
	Relational	High	“Customer requires good rapport, like buddy for smoothing cooperation and collaboration, good communication skill
	Organizational	High	“We emphasis on customer requirement and satisfaction and comply with ISO 9001, 1400 (OSHA), 1800 (environment) and quality standard”
Company E	Physical	Low	“We outsourced transportation from local forwarding companies (suppliers)”
	Technology	Medium	“Email, internet enhance our operations with paperless as compare to previous years ago”
	Management Expertise	Low	Not mentioned

	Relational	High	“What we do is be close friends”
	Organizational	Medium	“We provide 24 hours services to customers. Customers can text or email us at any time and place”
Company F	Physical	Low	Out-sourced, IT facilities
	Technology	Medium	“Technology for communication, documentations and services such as internet, email and fax,
	Management Expertise	Low	“Provide training when needed”
	Relational	High	“Establish good rapport with clients and always attend to their premises”
	Organizational	Low	Only suggestion for LSPs to comply with Health and Safety Occupation and Equipment
Company G	Physical	Medium	Own truck (more than 20 trucks) means lease truck for two years, we put our logo, but we never own. *“I think no need to have our own, we can get third party”* Immediate transmission thru EDI.
	Technology	High	Must have system that can communicate from beginning to end. Advance technology (GPS) for truck system,
	Management Expertise	High	People need to have professional logistics knowledge because we are working with the professional MNC. Staffs experiences are different.
	Relational	High	Build up relationship in team collaboration, share information (RFI)
	Organizational	High	ISO compliance; Fulfil customer requirements and commitment to customer is part of logistics business.

Appendix C: Summary of performance measure

Company	Performance Measure
A	Financial: growth and on time delivery Non financial: Customer service: additional, unique, better, quick response
B	Financial: growth and on time delivery Non financial: Improve service, reduce cost and response to clients
C	Financial: growth and on time delivery Non financial: maintain existing customer, create new business and reduce cost
D	Financial: loading and unloading duration Non financial: JIT and prompt response
E	Financial: maintain growth Non financial: low operations cost, meet customer requirement and provide good service
F	Financial: growth Non financial: Improve service, more service and focus on customer requirement
G	Financial: 100% update tracking Non financial: good service and competitive rate (look for economy mode)

Appendix D: Survey questionnaire

THE UNIVERSITY OF HULL

RESEARCH PROJECT ON LOGISTICS RESOURCES ACQUIRED BY LOGISTICS SERVICE PROVIDERS

June 2, 2009

To Logistics Manager,
Dear Sir/Madam,

PhD Research Project on the Logistics Resources

Pertaining to the above matter, I am pursuing a PhD program at the University of Hull Business School and Logistics Institute. I seek your kind assistance in completing this survey questionnaire.

There is no right or wrong answers. All Information will be held in the strictest confidence, as has always been the policy of University. When the results from my PhD thesis are published it will be impossible to identify an individual person or company.

The survey only takes about 30 minutes to complete. In exchange for your time, I will send an executive summary of my findings to those returning completed surveys, giving you usable information about this study discovery on resources acquired by LSP.

I am aware that your esteem organization has being very busy and undoubtedly, this has taken much of your time. However, your company's participation is very much important to meet with the objectives of this study. Many thanks for your valuable time and effort in completing this questionnaire. Your participation and assistance are highly appreciated in making this research successful.

Thank you very much for your help with this important research.

Yours faithfully,

Noorliza Karia
PhD Candidate
E: N.Karia@2007.hull.ac.uk
http://www.hull.ac.uk/hubs/people/phd/karia_n.html

Professor Chandra Lalwani
Main Supervisor
E: c.s.lalwani@hull.ac.uk

Dr. Chee Wong
Second Supervisor
E: c.wong@hull.ac.uk

The University of Hull Business School and Logistics Institute,
Cottingham Road, Hull
HU6 7RX, UK. T: +44 (0)1482 347548 F: +44 (0)1482 463484

LOGISTICS RESOURCES SURVEY

Section A Please CIRCLE the number that corresponds to how much you agree or disagree with the following statements.

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

1	My company inclines to employ multi-experienced workers	1	2	3	4	5
2	My company is able to provide logistics equipments (vehicles/warehouse/hub/base/other) to customers.	1	2	3	4	5
3	My company has provided software and computer system for logistics activities	1	2	3	4	5
4	My company provides training to upgrade logistics workers	1	2	3	4	5
5	My company provides web-based information system for all clients	1	2	3	4	5
6	My company continuously improves logistics facilities	1	2	3	4	5
7	My company consistently improve technology usage if it requires for logistics activities	1	2	3	4	5
8	Top management inclines to recruit workers with logistics skills or knowledge	1	2	3	4	5
9	My company commits to share information among business partners	1	2	3	4	5
10	My company establishes coordination/collaboration with business partners	1	2	3	4	5
11	Top management inclines to recruit experienced workers from the same industry	1	2	3	4	5
12	My company has corporate culture such as total quality management for quality service	1	2	3	4	5
13	My company employs environmental policy for safe/healthy/secure operations	1	2	3	4	5
14	My company employs continual improvement for sustainable service	1	2	3	4	5
15	My company inclines to recruit workers who have good communication skill	1	2	3	4	5
16	My company inclines to recruit educated workers	1	2	3	4	5
17	My company has provided basic communication tools such as email, telephone, fax, etc for logistics activities	1	2	3	4	5
18	My company uses product identification and tracking system (such as bar code, Electronic data interchangeable - EDI, IT solution or RFID) to support logistics activities	1	2	3	4	5
19	My company establishes trust and commitment among business partners	1	2	3	4	5
20	My company is able to provide customer satisfaction	1	2	3	4	5
21	My company acquires advance equipments for logistics operations	1	2	3	4	5
22	My company has focused on customer requirement	1	2	3	4	5
23	Our business partners see our relationship establishment as a long term alliances	1	2	3	4	5
24	Logistics facilities and equipments are frequently maintenances	1	2	3	4	5
25	My company is able to provide solution to customers	1	2	3	4	5
26	My company and business partners establish mutual relationship	1	2	3	4	5
27	My company is looking for new or technologically-advanced equipments for logistics operations	1	2	3	4	5
28	My company establishes informal interaction between business partners	1	2	3	4	5
29	My company establishes constant communication with business partners	1	2	3	4	5
30	My company consistently provides management and leadership training	1	2	3	4	5

Section B

This section would lead you to explain about the company as compare to competitors. Please CIRCLE the number that corresponds to how much you agree or disagree with the following statements.

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

1	As compared to main competitors our company has low distribution costs	1	2	3	4	5
2	As compared to main competitors our customers are more satisfied with our service level	1	2	3	4	5
3	As compared to main competitors our company provides additional service	1	2	3	4	5
4	As compared to main competitors our company has low equipment or facilities costs	1	2	3	4	5
5	As compared to main competitors our company offers greater percentage of on time and accurate delivery	1	2	3	4	5
6	As compared to main competitors our company offers unique solution	1	2	3	4	5
7	As compared to main competitors our company maintains low manpower costs	1	2	3	4	5
8	As compared to main competitors our company provides better services	1	2	3	4	5
9	As compared to main competitors our company provides quicker responses to customers	1	2	3	4	5

Based on the **previous 3 years** please specify:

a. The percentage of the **company growth:** _________%

b. The percentage of **"on time delivery"** : _________%

c. Average **length of contract** with the main business partners: ________ years

Section C- *Company Profile*

This section relates to the background of your company. The questions are meant only for analysis purposes and it will NOT be used to indentify your responses individually. Please select one from the alternatives provided.

1. Name of your company (optional): ____

2. The main business of your company:

Air/sea cargo		Warehousing	
Container services		Shipping	
Freight forwarders		Courier services	
Transportation/		Others (Please	

delivery		specify)	

3. Ownership of company

1	Local company
2	Joint venture
3	Foreign company Please specify ____________________

4. Number of years the company has been operating ____________________________

5. Number of full time employees in your company

1	Less than 50
2	50 to 100
3	101 to 200
4	201 to 500
5	More than 500
6	Other (please specify)

6. To what extent are the following **logistics resources** acquired by your company? (Please rate where 0 = not at all, and 4 = large extent)

Equipments	0	1	2	3	4
Facilities	0	1	2	3	4
IT/Technology	0	1	2	3	4
Relationship with trading partners	0	1	2	3	4
Experience workers	0	1	2	3	4
Professional workers	0	1	2	3	4
Organizational procedures/code of practices/policy	0	1	2	3	4
If others please specify_________________	0	1	2	3	4

7. To what extent the following **logistics resources** give impact on logistics performance? (Please rate where 0 = not at all, and 4 = large extent)

Equipment	0	1	2	3	4
Facilities	0	1	2	3	4
IT/Technology	0	1	2	3	4
Relationship with trading partners	0	1	2	3	4
Experience workers	0	1	2	3	4
Professional workers	0	1	2	3	4

Organizational procedures/code of practices/policy	0	1	2	3	4
If others please specify_________________	0	1	2	3	4

8. To what extent are the following **technologies/IT** used by company?
   (Please rate where 0 = not at all, and 4 = large extent)

Email	0	1	2	3	4
Internet	0	1	2	3	4
EDI	0	1	2	3	4
Intranet	0	1	2	3	4
Bar-coding	0	1	2	3	4
Electronic funds transfer/ Transfer Transaction (TT)	0	1	2	3	4
Enterprise resource planning	0	1	2	3	4
Activity-based costing	0	1	2	3	4
If others please specify_________________	0	1	2	3	4

9. To what extent are the following **facilities and equipments** acquired by your company?
   (Please rate where 0 = not at all, and 4 = large extent)

Warehouse/space floor	0	1	2	3	4
Rail	0	1	2	3	4
Container Yard					
Hubs	0	1	2	3	4
Bases	0	1	2	3	4
Vessels	0	1	2	3	4
Vessels	0	1	2	3	4
Vehicles: truck/haulage/lorry/prime mover	0	1	2	3	4
If others please specify_________________	0	1	2	3	4

10. To what extent are the following factors can **measure logistics performances**?
    (Please rate where 0 = not at all and 4 = large extent)

Cost	0	1	2	3	4
Delivery	0	1	2	3	4
Quality	0	1	2	3	4
Flexibility	0	1	2	3	4
Innovation	0	1	2	3	4
Other (please specify) ____________________	0	1	2	3	4

11. What is the uptake of the following **management practices** by the company? (Please rate where 0 = not at all and 4 = large extent)

Focus on customer	0	1	2	3	4
Quality management	0	1	2	3	4
Policy on environment	0	1	2	3	4
Continual improvement	0	1	2	3	4
Other (please specify) _________________	0	1	2	3	4

Section D – *Respondent Profile*

1. Your Position in the company: _______________________________

2.

Working Experience With	Number of year
Current employer	
Different industry	
With logistics industry	
Total work experience	

3. Gender

1	Male
2	Female

4. Your highest education level

1	High School/SPM
2.	Diploma/Certificate
3	Degree
4	Master and above
5	Other (please specify)

5. Please indicate your logistics **skills/knowledge/competence:**

____
____

6. Comment

____
____

THANK YOU FOR YOUR KIND PARTICIPATION IN THIS SURVEY.
YOUR ANSWER WILL BE KEPT CONFIDENTIAL.

Please send your answered questionnaire promptly to:

Noorliza Karia
Logistics Institute, Hull University Business School,
Cottingham Road, Hull
HU6 7RX, UK. T: +44 (0)1482 347548 F: +44 (0)1482 463484

Appendix E: Non response bias test

RBLs acquired

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
A1	Equal variances assumed	.004	.948	1.514	120	.133	.277	.183	-.085	.640
	Equal variances not assumed			1.666	34.672	.105	.277	.166	-.061	.615
A2	Equal variances assumed	.893	.347	.611	121	.542	.119	.194	-.266	.504
	Equal variances not assumed			.585	29.530	.563	.119	.203	-.296	.534
A3	Equal variances assumed	.107	.744	2.048	121	.043	.374	.183	.012	.736
	Equal variances not assumed			2.193	33.314	.035	.374	.171	.027	.721
A4	Equal variances assumed	4.132	.044	.267	121	.790	.057	.214	-.366	.481
	Equal variances not assumed			.344	44.205	.733	.057	.166	-.278	.392
A5	Equal variances assumed	1.476	.227	1.085	121	.280	.259	.239	-.214	.731
	Equal variances not assumed			1.392	44.005	.171	.259	.186	-.116	.633
A6	Equal variances assumed	.185	.667	.460	121	.646	.077	.168	-.256	.411
	Equal variances not assumed			.476	32.044	.637	.077	.163	-.254	.408
A7	Equal variances assumed	.842	.361	-.510	120	.611	-.095	.187	-.466	.275
	Equal variances not assumed			-.549	33.640	.587	-.095	.174	-.449	.258
A8	Equal variances assumed	1.191	.277	.295	121	.768	.055	.186	-.313	.423
	Equal variances not assumed			.349	38.192	.729	.055	.157	-.264	.373
A9	Equal variances assumed	.534	.466	1.539	121	.126	.296	.192	-.085	.677
	Equal variances not assumed			1.482	29.692	.149	.296	.200	-.112	.704
A10	Equal variances assumed	.053	.819	-.410	121	.683	-.069	.169	-.404	.265
	Equal variances not assumed			-.423	31.914	.675	-.069	.164	-.403	.264

A11	Equal variances assumed	.296	.588	-.729	120	.467	-.148	.203	-.551	.254
	Equal variances not assumed			-.777	33.238	.443	-.148	.191	-.536	.240
A12	Equal variances assumed	.002	.962	1.033	119	.304	.172	.166	-.157	.501
	Equal variances not assumed			1.058	31.865	.298	.172	.162	-.159	.502
A13	Equal variances assumed	.571	.451	.815	120	.417	.172	.211	-.246	.589
	Equal variances not assumed			1.011	41.716	.318	.172	.170	-.171	.515
A14	Equal variances assumed	.644	.424	1.653	120	.101	.261	.158	-.052	.573
	Equal variances not assumed			1.511	28.398	.142	.261	.173	-.093	.614
A15	Equal variances assumed	1.809	.181	1.958	120	.053	.335	.171	-.004	.675
	Equal variances not assumed			1.969	31.132	.058	.335	.170	-.012	.683

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
A16	Equal variances assumed	.028	.867	.556	120	.579	.102	.183	-.261	.465
	Equal variances not assumed			.546	30.400	.589	.102	.186	-.279	.482
A17	Equal variances assumed	1.659	.200	1.610	120	.110	.268	.167	-.062	.598
	Equal variances not assumed			1.689	32.645	.101	.268	.159	-.055	.591
A18	Equal variances assumed	.031	.860	1.389	120	.167	.270	.194	-.115	.655
	Equal variances not assumed			1.401	31.212	.171	.270	.193	-.123	.663
A19	Equal variances assumed	.620	.433	1.096	119	.275	.167	.152	-.134	.468
	Equal variances not assumed			1.086	30.726	.286	.167	.153	-.147	.480
A20	Equal variances assumed	.042	.838	2.044	120	.043	.336	.165	.011	.662
	Equal variances not assumed			2.018	30.533	.052	.336	.167	-.004	.676

A21	Equal variances assumed	.177	.674	-.301	119	.764	-.045	.151	-.345	.254
	Equal variances not assumed			-.296	30.588	.769	-.045	.153	-.358	.267
A22	Equal variances assumed	.185	.668	1.201	119	.232	.187	.156	-.121	.495
	Equal variances not assumed			1.166	30.119	.253	.187	.160	-.140	.514
A23	Equal variances assumed	2.690	.104	1.680	120	.096	.300	.179	-.054	.654
	Equal variances not assumed			1.806	33.615	.080	.300	.166	-.038	.638
A24	Equal variances assumed	.268	.606	1.709	119	.090	.273	.160	-.043	.589
	Equal variances not assumed			1.696	30.789	.100	.273	.161	-.055	.601
A25	Equal variances assumed	1.024	.314	1.955	120	.053	.315	.161	-.004	.633
	Equal variances not assumed			1.871	29.601	.071	.315	.168	-.029	.658
A26	Equal variances assumed	1.680	.197	2.913	119	.004	.428	.147	.137	.718
	Equal variances not assumed			2.710	27.153	.012	.428	.158	.104	.751
A27	Equal variances assumed	.051	.822	.139	120	.890	.025	.184	-.338	.389
	Equal variances not assumed			.147	33.060	.884	.025	.173	-.327	.378
A28	Equal variances assumed	.432	.512	.982	120	.328	.172	.175	-.175	.518
	Equal variances not assumed			.993	31.305	.328	.172	.173	-.181	.525
A29	Equal variances assumed	1.908	.170	1.000	120	.319	.149	.149	-.146	.444
	Equal variances not assumed			1.029	31.909	.311	.149	.145	-.146	.444
A30	Equal variances assumed	1.092	.298	1.605	120	.111	.298	.186	-.070	.666
	Equal variances not assumed			1.619	31.244	.115	.298	.184	-.077	.674

Logistics performance: Non-financial

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
B1	Equal variances assumed	1.668	.199	-.208	120	.836	-.041	.197	-.431	.349
	Equal variances not assumed			-.246	38.521	.807	-.041	.166	-.378	.296
B2	Equal variances assumed	.919	.340	1.826	120	.070	.314	.172	-.026	.654
	Equal variances not assumed			1.831	31.032	.077	.314	.171	-.036	.663
B3	Equal variances assumed	.241	.625	1.270	120	.206	.212	.167	-.118	.542
	Equal variances not assumed			1.459	36.781	.153	.212	.145	-.082	.506
B4	Equal variances assumed	.824	.366	.381	120	.704	.075	.196	-.313	.462
	Equal variances not assumed			.446	37.957	.658	.075	.167	-.264	.413
B5	Equal variances assumed	.013	.911	.000	120	1.000	.000	.167	-.330	.330
	Equal variances not assumed			.000	31.579	1.000	.000	.163	-.333	.333
B6	Equal variances assumed	.021	.886	-.568	120	.571	-.100	.176	-.448	.248
	Equal variances not assumed			-.563	30.647	.577	-.100	.178	-.462	.262
B7	Equal variances assumed	.216	.643	1.200	120	.232	.235	.195	-.152	.621
	Equal variances not assumed			1.169	30.118	.251	.235	.201	-.175	.644
B8	Equal variances assumed	.689	.408	.536	119	.593	.090	.168	-.242	.422
	Equal variances not assumed			.463	25.622	.647	.090	.194	-.310	.490
B9	Equal variances assumed	.577	.449	-.251	119	.802	-.040	.161	-.359	.278
	Equal variances not assumed			-.238	29.319	.814	-.040	.170	-.388	.307

Appendix F: Test of differences on logistics performance

Across ownership

Group Statistics

	Owner status	N	Mean	Std. Deviation	Std. Error Mean
Customer Innovation	1	60	3.9622	.61321	.07916
	2	58	4.0621	.59470	.07809
Cost	1	60	3.4417	.79240	.10230
	2	58	3.7931	.65584	.08612
	2	58	3.9276	.57785	.07588

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Customer Innovation	Equal variances assumed	.126	.723	-.897	116	.371	-.09985	.11126	-.32020	.12051
	Equal variances not assumed			-.898	115.999	.371	-.09985	.11120	-.32009	.12039
Cost	Equal variances assumed	.585	.446	-2.620	116	.010	-.35144	.13415	-.61713	-.08574
	Equal variances not assumed			-2.628	113.337	.010	-.35144	.13372	-.61635	-.08652
	Equal variances not assumed			-2.094	115.991	.038	-.22564	.10777	-.43909	-.01219

Across business duration

Group Statistics

	Business duration	N	Mean	Std. Deviation	Std. Error Mean
CustInnovation	1	45	4.0148	.58234	.08681
	2	49	4.1054	.60351	.08622
Cost	1	45	3.8333	.60302	.08989
	2	49	3.3776	.85714	.12245

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Customer Innovation	Equal variances assumed	.934	.336	-.740	92	.461	-.09063	.12254	-.33400	.15274
	Equal variances not assumed			-.741	91.767	.461	-.09063	.12235	-.33363	.15238
Cost	Equal variances assumed	3.307	.072	2.957	92	.004	.45578	.15413	.14967	.76189
	Equal variances not assumed			3.000	86.327	.004	.45578	.15190	.15383	.75774
	Equal variances not assumed			1.502	91.999	.137	.18258	.12159	-.05890	.42406

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
CustInnovation	1	27	4.0025	.50399	.09699	3.8031	4.2018	3.00	5.00
	2	17	4.2549	.57770	.14011	3.9579	4.5519	3.33	5.00
	3	23	3.7725	.71940	.15001	3.4614	4.0836	2.33	4.83
	4	19	3.8772	.49951	.11460	3.6364	4.1180	3.00	4.83
	5	28	4.1310	.57442	.10855	3.9082	4.3537	3.00	5.00
	Total	114	4.0044	.59340	.05558	3.8943	4.1145	2.33	5.00
Cost	1	27	3.7222	.73815	.14206	3.4302	4.0142	1.50	5.00
	2	17	3.6765	.80896	.19620	3.2605	4.0924	2.00	5.00
	3	23	3.4783	.57363	.11961	3.2302	3.7263	2.50	4.50
	4	19	3.3421	.60214	.13814	3.0519	3.6323	1.50	4.00
	5	28	3.7321	.89734	.16958	3.3842	4.0801	1.00	5.00
	Total	114	3.6053	.74511	.06979	3.4670	3.7435	1.00	5.00

Across firm size

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Customer Innovation	1.669	4	109	.162
Cost	1.256	4	109	.292

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Customer Innovation	Between Groups	3.060	4	.765	2.270	.066
	Within Groups	36.730	109	.337		
	Total	39.790	113			
Cost	Between Groups	2.593	4	.648	1.175	.326
	Within Groups	60.144	109	.552		
	Total	62.737	113			
	Within Groups	36.837	109	.338		
	Total	39.280	113			

Robust Tests of Equality of Means

		Statistic[a]	df1	df2	Sig.
CustInnovation	Welch	1.960	4	51.019	.115
	Brown-Forsythe	2.270	4	95.911	.067
Cost	Welch	1.358	4	51.442	.262
	Brown-Forsythe	1.209	4	96.041	.312
	Brown-Forsythe	1.860	4	102.899	.123

a. Asymptotically F distributed.

Appendix G: Test of Differences on resources

Across firm size

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
Physical	1	27	3.8148	.68146	.13115	3.5452	4.0844	2.00	5.00
	2	17	4.1176	.58762	.14252	3.8155	4.4198	2.60	5.00
	3	23	4.1478	.53332	.11120	3.9172	4.3784	3.20	5.00
	4	20	3.8500	.66134	.14788	3.5405	4.1595	3.00	5.00
	5	28	4.1661	.57382	.10844	3.9436	4.3886	3.00	5.00
	Total	115	4.0178	.62060	.05787	3.9032	4.1325	2.00	5.00
Technology	1	27	4.1420	.49776	.09579	3.9451	4.3389	3.00	5.00
	2	17	4.2353	.41899	.10162	4.0199	4.4507	3.25	5.00
	3	23	4.3043	.65694	.13698	4.0203	4.5884	3.00	5.00
	4	20	4.1250	.64124	.14338	3.8249	4.4251	3.00	5.00
	5	28	4.2500	.62361	.11785	4.0082	4.4918	3.00	5.00
	Total	115	4.2116	.57421	.05355	4.1055	4.3177	3.00	5.00
Organizational	1	27	4.2679	.46478	.08945	4.0840	4.4518	3.40	5.00
	2	17	4.2941	.43513	.10553	4.0704	4.5178	3.50	5.00
	3	23	4.1594	.48063	.10022	3.9516	4.3673	3.33	5.00
	4	19	4.0175	.64285	.14748	3.7077	4.3274	2.83	5.00
	5	28	4.2500	.57467	.10860	4.0272	4.4728	3.00	5.00
	Total	114	4.2038	.52459	.04913	4.1065	4.3011	2.83	5.00
Relational	1	27	4.1235	.46362	.08922	3.9401	4.3069	3.33	5.00
	2	17	4.0000	.47140	.11433	3.7576	4.2424	3.33	5.00
	3	23	4.1449	.57583	.12007	3.8959	4.3939	3.00	5.00
	4	20	3.8167	.58714	.13129	3.5419	4.0915	3.00	5.00
	5	28	3.8452	.76164	.14394	3.5499	4.1406	2.00	5.00
	Total	115	3.9884	.59878	.05584	3.8778	4.0990	2.00	5.00
Mgmt Expertise	1	27	3.6636	.64279	.12371	3.4093	3.9179	2.00	4.75
	2	17	3.9118	.39470	.09573	3.7088	4.1147	3.00	4.75
	3	23	4.0543	.51653	.10770	3.8310	4.2777	3.25	5.00
	4	20	3.8792	.58519	.13085	3.6053	4.1530	2.75	4.75
	5	28	3.8929	.70851	.13390	3.6181	4.1676	2.75	5.00
	Total	115	3.8717	.60075	.05602	3.7608	3.9827	2.00	5.00

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Physical	.214	4	110	.930
Technology	2.826	4	110	.028
Organizational	1.795	4	109	.135
Relational	2.109	4	110	.084
MgmtExpertise	2.736	4	110	.032

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Physical	Between Groups	2.850	4	.712	1.909	.114
	Within Groups	41.056	110	.373		
	Total	43.906	114			
Technology	Between Groups	.530	4	.132	.393	.813
	Within Groups	37.058	110	.337		
	Total	37.587	114			
Organizational	Between Groups	1.014	4	.253	.918	.456
	Within Groups	30.083	109	.276		
	Total	31.097	113			
Relational	Between Groups	2.222	4	.556	1.581	.184
	Within Groups	38.651	110	.351		
	Total	40.873	114			
MgmtExpertise	Between Groups	1.978	4	.494	1.389	.243
	Within Groups	39.165	110	.356		
	Total	41.143	114			

Robust Tests of Equality of Means

		Statistic[a]	df1	df2	Sig.
Physical	Welch	1.729	4	51.849	.158
	Brown-Forsythe	1.916	4	101.550	.114
Technology	Welch	.362	4	52.572	.834
	Brown-Forsythe	.402	4	99.439	.807
Organizational	Welch	.747	4	51.263	.564
	Brown-Forsythe	.918	4	93.014	.457
Relational	Welch	1.524	4	52.266	.209
	Brown-Forsythe	1.655	4	100.827	.166
MgmtExpertise	Welch	1.382	4	53.718	.253
	Brown-Forsythe	1.493	4	105.952	.210

a. Asymptotically F distributed.

Test of differences across business duration

Group Statistics

	Business duration	N	Mean	Std. Deviation	Std. Error Mean
Physical	1	45	3.9956	.56486	.08420
	2	50	3.9890	.68655	.09709
Technology	1	45	4.1963	.54098	.08065
	2	50	4.2500	.55787	.07890
Organizational	1	45	4.1793	.52759	.07865
	2	49	4.2449	.51043	.07292
Relational	1	45	3.9481	.56834	.08472
	2	50	3.9733	.64888	.09177
MgmtExpertise	1	45	3.9037	.54499	.08124
	2	50	3.7267	.66048	.09341

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Physical	Equal variances assumed	1.578	.212	.050	93	.960	.00656	.12984	-.25129	.26440
	Equal variances not assumed			.051	92.288	.959	.00656	.12852	-.24869	.26180
Technology	Equal variances assumed	.000	.998	-.475	93	.636	-.05370	.11300	-.27811	.17070
	Equal variances not assumed			-.476	92.469	.635	-.05370	.11282	-.27776	.17035
Organizational	Equal variances assumed	.006	.939	-.613	92	.541	-.06564	.10710	-.27834	.14707
	Equal variances not assumed			-.612	90.713	.542	-.06564	.10725	-.27869	.14741
Relational	Equal variances assumed	1.840	.178	-.200	93	.842	-.02519	.12577	-.27495	.22458
	Equal variances not assumed			-.202	92.937	.841	-.02519	.12490	-.27320	.22283
MgmtExpertise	Equal variances assumed	1.319	.254	1.416	93	.160	.17704	.12505	-.07129	.42536
	Equal variances not assumed			1.430	92.333	.156	.17704	.12379	-.06882	.42289

Test of differences across ownership status

Group Statistics

	Ownerstatus	N	Mean	Std. Deviation	Std. Error Mean
Physical	1	61	3.9484	.60800	.07785
	2	58	4.0483	.62499	.08207
Technology	1	61	4.1776	.54486	.06976
	2	58	4.2457	.60425	.07934
Organizational	1	60	4.1761	.55446	.07158
	2	58	4.2270	.47828	.06280
Relational	1	61	3.8743	.59056	.07561
	2	58	4.0977	.58242	.07648
MgmtExpertise	1	61	3.7336	.57671	.07384
	2	58	3.9698	.63536	.08343

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Physical	Equal variances assumed	.408	.524	-.884	117	.379	-.09992	.11303	-.32377	.12394
	Equal variances not assumed			-.883	116.285	.379	-.09992	.11311	-.32395	.12412
Technology	Equal variances assumed	1.476	.227	-.646	117	.519	-.06809	.10537	-.27678	.14059
	Equal variances not assumed			-.645	114.301	.521	-.06809	.10565	-.27738	.14119
Organizational	Equal variances assumed	1.581	.211	-.533	116	.595	-.05090	.09546	-.23998	.13818
	Equal variances not assumed			-.535	114.541	.594	-.05090	.09522	-.23953	.13773
Relational	Equal variances assumed	.128	.721	-2.076	117	.040	-.22338	.10758	-.43645	-.01032
	Equal variances not assumed			-2.077	116.840	.040	-.22338	.10754	-.43637	-.01039
MgmtExpertise	Equal variances assumed	.276	.600	-2.125	117	.036	-.23622	.11114	-.45632	-.01612
	Equal variances not assumed			-2.120	114.520	.036	-.23622	.11141	-.45691	-.01553

Appendix H: Critical assumption for factor analysis

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.872
Bartlett's Test of Sphericity	Approx. Chi-Square	1987.905
	df	435
	Sig.	.000

		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15
Anti-image Correlation	A1	.845	-.144	-.155	.167	-.195	.084	-.224	.054	-.026	-.189	-.083	-.047	-.116	.079	-.081
	A2	-.144	.895	-.169	-.173	.060	-.227	-.030	.118	.272	-.248	-.129	.215	-.040	-.065	.081
	A3	-.155	-.169	.924	-.212	.064	-.016	.019	-.021	-.121	.001	-.055	-.075	-.072	-.124	.107
	A4	.167	-.173	-.212	.907	-.306	.000	-.159	-.066	-.127	-.107	.072	-.218	.045	.113	-.047
	A5	-.195	.060	.064	-.306	.859	-.310	.214	-.277	.031	.234	-.049	.036	-.190	-.056	-.087
	A6	.084	-.227	-.016	.000	-.310	.883	-.472	-.039	.147	-.120	-.151	.077	.095	.082	-.076
	A7	-.224	-.030	.019	-.159	.214	-.472	.832	-.321	-.110	.181	.114	.000	-.171	-.151	.027
	A8	.054	.118	-.021	-.066	-.277	-.039	-.321	.859	-.044	-.241	-.154	.093	.218	-.094	.244
	A9	-.026	.272	-.121	-.127	.031	.147	-.110	-.044	.801	-.410	-.238	.271	-.098	-.073	-.104
	A10	-.189	-.248	.001	-.107	.234	-.120	.181	-.241	-.410	.807	.133	-.231	.056	-.076	-.138
	A11	-.083	-.129	-.055	.072	-.049	-.151	.114	-.154	-.238	.133	.851	-.178	-.054	.053	.006
	A12	-.047	.215	-.075	-.218	.036	.077	.000	.093	.271	-.231	-.178	.834	.010	-.320	.035
	A13	-.116	-.040	-.072	.045	-.190	.095	-.171	.218	-.098	.056	-.054	.010	.862	-.286	.131
	A14	.079	-.065	-.124	.113	-.056	.082	-.151	-.094	-.073	-.076	.053	-.320	-.286	.914	-.191
	A15	-.081	.081	.107	-.047	-.087	-.076	.027	.244	-.104	-.138	.006	.035	.131	-.191	.846
	A16	.053	.025	-.054	.129	-.158	.202	-.114	-.120	.222	-.241	-.177	.011	-.177	.175	-.266
	A17	.077	-.101	-.119	-.109	.190	.127	-.003	-.146	.085	.108	-.114	.138	-.163	-.057	-.386
	A18	.134	-.073	.026	.022	-.127	-.178	.150	.102	-.149	-.009	.128	-.188	.111	-.225	.191
	A19	-.134	-.099	.219	-.007	-.047	-.045	.014	.052	-.167	-.045	.025	-.156	-.107	.190	.087
	A20	-.165	.092	-.004	-.203	.036	.091	.140	-.220	.216	.105	-.069	.258	-.114	-.107	-.212
	A21	.163	-.101	-.055	-.051	-.140	.171	-.331	.219	-.071	-.176	.048	-.046	.194	.026	.047
	A22	.182	.056	.037	.161	-.103	-.038	-.222	.149	.004	-.111	.022	.112	.157	-.159	.113
	A23	.098	.089	-.095	.100	-.096	-.173	.045	.110	-.030	-.168	.046	-.004	-.150	.126	-.159
	A24	.067	-.150	.037	.040	-.126	.067	-.244	.077	.036	-.001	-.027	-.190	-.015	.100	.045
	A25	-.084	.108	-.022	-.046	.198	-.213	.101	-.144	.073	.097	.086	-.084	-.031	-.123	-.113

	A26	-.037	-.179	-.052	.031	.058	-.051	.052	.004	-.360	.068	.180	-.108	.193	.025	.080
	A27	-.197	.059	.159	-.154	.102	.010	-.007	-.247	.129	.196	-.119	.128	-.153	.008	-.086
	A28	.175	.083	.015	-.085	-.118	.084	.041	.191	.038	-.147	-.143	.063	-.044	-.011	.049
	A29	-.041	-.021	.004	.200	.052	-.055	.048	-.142	-.009	.067	.111	-.102	-.017	-.125	.068
	A30	-.159	-.068	-.016	-.275	.123	-.234	.348	-.076	-.206	.267	-.051	-.090	.002	-.088	-.062

		A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30
Anti-image Correlation	A1	.053	.077	.134	-.134	-.165	.163	.182	.098	.067	-.084	-.037	-.197	.175	-.041	-.159
	A2	.025	-.101	-.073	-.099	.092	-.101	.056	.089	-.150	.108	-.179	.059	.083	-.021	-.068
	A3	-.054	-.119	.026	.219	-.004	-.055	.037	-.095	.037	-.022	-.052	.159	.015	.004	-.016
	A4	.129	-.109	.022	-.007	-.203	-.051	.161	.100	.040	-.046	.031	-.154	-.085	.200	-.275
	A5	-.158	.190	-.127	-.047	.036	-.140	-.103	-.096	-.126	.198	.058	.102	-.118	.052	.123
	A6	.202	.127	-.178	-.045	.091	.171	-.038	-.173	.067	-.213	-.051	.010	.084	-.055	-.234
	A7	-.114	-.003	.150	.014	.140	-.331	-.222	.045	-.244	.101	.052	-.007	.041	.048	.348
	A8	-.120	-.146	.102	.052	-.220	.219	.149	.110	.077	-.144	.004	-.247	.191	-.142	-.076
	A9	.222	.085	-.149	-.167	.216	-.071	.004	-.030	.036	.073	-.360	.129	.038	-.009	-.206
	A10	-.241	.108	-.009	-.045	.105	-.176	-.111	-.168	-.001	.097	.068	.196	-.147	.067	.267
	A11	-.177	-.114	.128	.025	-.069	.048	.022	.046	-.027	.086	.180	-.119	-.143	.111	-.051
	A12	.011	.138	-.188	-.156	.258	-.046	.112	-.004	-.190	-.084	-.108	.128	.063	-.102	-.090
	A13	-.177	-.163	.111	-.107	-.114	.194	.157	-.150	-.015	-.031	.193	-.153	-.044	-.017	.002
	A14	.175	-.057	-.225	.190	-.107	.026	-.159	.126	.100	-.123	.025	.008	-.011	-.125	-.088
	A15	-.266	-.386	.191	.087	-.212	.047	.113	-.159	.045	-.113	.080	-.086	.049	.068	-.062
	A16	.859	.001	-.083	-.040	.021	-.135	-.082	.033	.041	.024	-.194	.040	-.126	.152	-.183

	A17	.001	.861	-.296	-.224	.280	.013	-.146	-.008	-.166	-.088	-.111	.213	-.008	-.107	.077
	A18	-.083	-.296	.868	-.115	-.238	.007	-.139	-.030	-.094	.113	.054	-.416	.036	.243	.141
	A19	-.040	-.224	-.115	.909	-.231	.013	.053	-.129	.103	.099	-.066	.083	-.009	-.292	-.058
	A20	.021	.280	-.238	-.231	.787	-.437	-.108	.113	-.121	-.161	-.274	.437	-.020	-.170	.101
	A21	-.135	.013	.007	.013	-.437	.830	.095	.067	.018	-.052	.191	-.431	.153	-.136	-.055
	A22	-.082	-.146	-.139	.053	-.108	.095	.893	-.176	.072	-.226	.026	.065	-.050	-.143	-.223
	A23	.033	-.008	-.030	-.129	.113	.067	-.176	.914	-.124	-.192	-.125	-.129	.209	-.142	.057
	A24	.041	-.166	-.094	.103	-.121	.018	.072	-.124	.949	-.180	-.132	.012	-.094	-.063	-.031
	A25	.024	-.088	.113	.099	-.161	-.052	-.226	-.192	-.180	.928	-.148	-.025	-.173	.070	.058
	A26	-.194	-.111	.054	-.066	-.274	.191	.026	-.125	-.132	-.148	.915	-.297	.023	-.044	.012
	A27	.040	.213	-.416	.083	.437	-.431	.065	-.129	.012	-.025	-.297	.797	-.333	.011	-.152
	A28	-.126	-.008	.036	-.009	-.020	.153	-.050	.209	-.094	-.173	.023	-.333	.858	-.451	-.079
	A29	.152	-.107	.243	-.292	-.170	-.136	-.143	-.142	-.063	.070	-.044	.011	-.451	.886	-.125
	A30	-.183	.077	.141	-.058	.101	-.055	-.223	.057	-.031	.058	.012	-.152	-.079	-.125	.879

Communalities

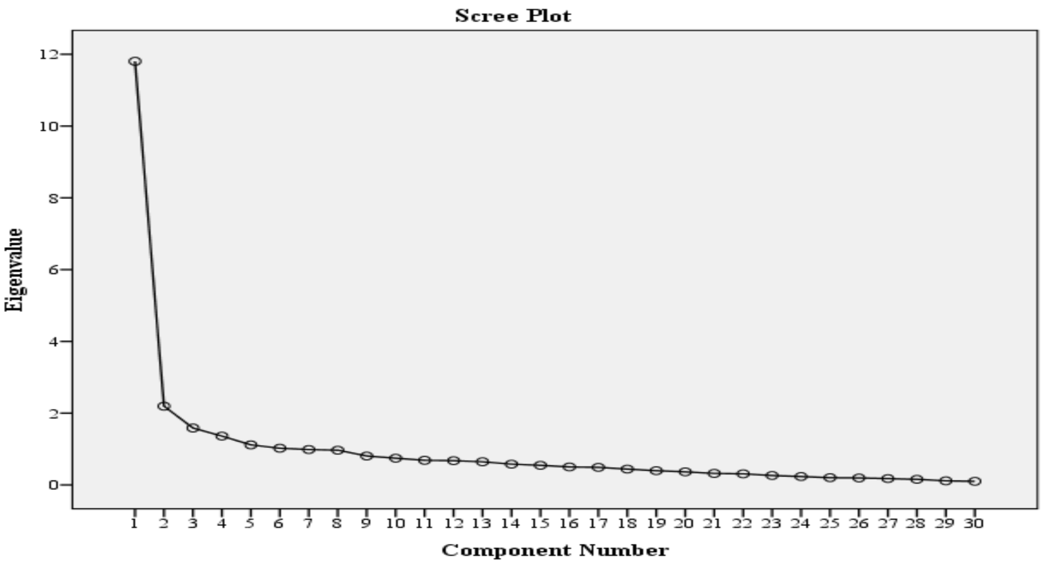
	Initial	Extraction
A1	1.000	.665
A2	1.000	.556
A3	1.000	.533
A4	1.000	.719
A5	1.000	.608
A6	1.000	.745
A7	1.000	.740
A8	1.000	.595
A9	1.000	.598
A10	1.000	.727
A11	1.000	.619
A12	1.000	.463
A13	1.000	.603
A14	1.000	.607
A15	1.000	.453
A16	1.000	.418
A17	1.000	.638
A18	1.000	.629
A19	1.000	.632
A20	1.000	.769
A21	1.000	.716
A22	1.000	.649
A23	1.000	.607
A24	1.000	.632
A25	1.000	.687
A26	1.000	.645
A27	1.000	.734
A28	1.000	.737
A29	1.000	.730
A30	1.000	.633

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.804	39.348	39.348	11.804	39.348	39.348
2	2.195	7.316	46.664	2.195	7.316	46.664
3	1.586	5.288	51.952	1.586	5.288	51.952
4	1.362	4.539	56.491	1.362	4.539	56.491
5	1.116	3.721	60.212	1.116	3.721	60.212
6	1.022	3.408	63.620	1.022	3.408	63.620
7	.987	3.289	66.909			
8	.969	3.229	70.138			
9	.807	2.690	72.828			
10	.745	2.485	75.313			
11	.687	2.290	77.603			
12	.677	2.256	79.859			
13	.646	2.153	82.012			
14	.580	1.934	83.946			
15	.547	1.822	85.768			
16	.501	1.669	87.437			
17	.491	1.636	89.074			
18	.442	1.473	90.547			
19	.396	1.321	91.867			
20	.365	1.216	93.083			
21	.321	1.070	94.153			
22	.310	1.033	95.186			
23	.264	.879	96.065			
24	.234	.780	96.845			
25	.202	.675	97.520			
26	.194	.647	98.167			
27	.177	.589	98.756			
28	.157	.522	99.278			
29	.115	.384	99.662			
30	.101	.338	100.000			

Extraction Method: Principal Component Analysis.


Scree Plot
Eigenvalue
Component Number
0
2
4
6
8
10
12
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Appendix I: Factor analysis for tangible resource

Communalities

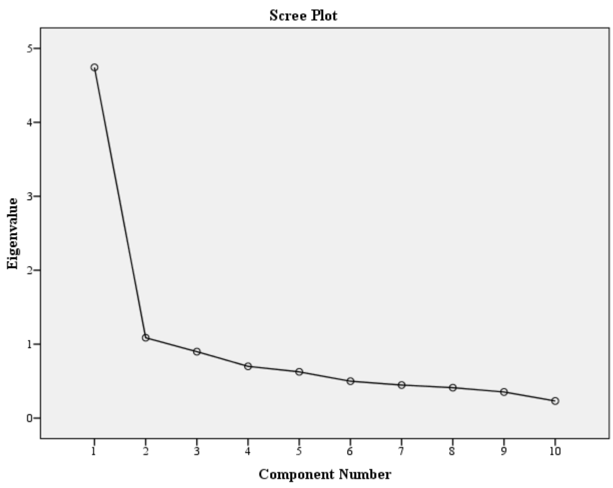
	Initial	Extraction
A27	1.000	.637
A5	1.000	.582
A21	1.000	.571
A6	1.000	.627
A7	1.000	.586
A18	1.000	.496
A17	1.000	.688
A3	1.000	.496
A24	1.000	.583
A2	1.000	.564

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.743	47.431	47.431	4.743	47.431	47.431	3.188	31.880	31.880
2	1.087	10.870	58.300	1.087	10.870	58.300	2.642	26.421	58.300
3	.899	8.992	67.293						
4	.700	7.003	74.296						
5	.626	6.258	80.554						
6	.499	4.993	85.547						
7	.447	4.475	90.022						
8	.412	4.121	94.143						
9	.354	3.537	97.680						
10	.232	2.320	100.000						

Extraction Method: Principal Component Analysis.



Component Matrix[a]

	Component	
	1	2
A6	.790	
A7	.761	
A24	.734	.210
A2	.719	.217
A18	.704	
A27	.678	-.422
A5	.664	-.376
A21	.663	-.362
A3	.567	.418
A17	.571	.602

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

Rotated Component Matrix[a]

	Component	
	1	2
A27	.789	.122
A5	.749	.148
A21	.739	.158
A6	.633	.475
A7	.627	.438
A18	.547	.444
A17		.829
A3	.157	.686
A24	.420	.638
A2	.404	.633

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

Component Transformation Matrix

Component	1	2
1	.758	.652
2	-.652	.758

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

Appendix J: Factor analysis for intangible resource

Communalities

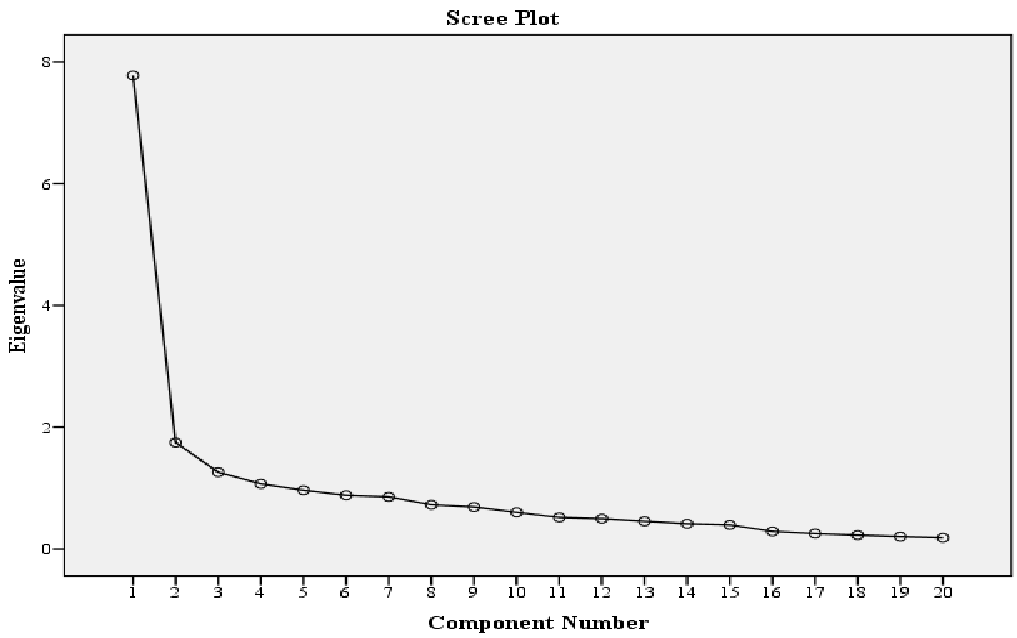
	Initial	Extraction
A29	1.000	.731
A22	1.000	.654
A25	1.000	.677
A28	1.000	.663
A26	1.000	.721
A19	1.000	.523
A20	1.000	.458
A4	1.000	.626
A11	1.000	.609
A1	1.000	.457
A8	1.000	.482
A10	1.000	.722
A9	1.000	.564
A15	1.000	.457
A16	1.000	.474
A12	1.000	.364
A30	1.000	.638
A23	1.000	.619
A13	1.000	.709
A14	1.000	.704

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.776	38.878	38.878	7.776	38.878	38.878	4.358	21.789	21.789
2	1.748	8.742	47.620	1.748	8.742	47.620	2.929	14.646	36.435
3	1.260	6.299	53.919	1.260	6.299	53.919	2.452	12.258	48.693
4	1.068	5.340	59.260	1.068	5.340	59.260	2.113	10.566	59.260
5	.965	4.825	64.084						
6	.882	4.409	68.494						
7	.856	4.280	72.774						
8	.725	3.626	76.399						
9	.689	3.445	79.845						
10	.601	3.005	82.850						
11	.518	2.589	85.439						
12	.497	2.487	87.926						
13	.455	2.276	90.202						
14	.414	2.068	92.271						
15	.395	1.973	94.244						
16	.288	1.438	95.682						
17	.252	1.260	96.942						
18	.227	1.134	98.075						
19	.202	1.011	99.086						
20	.183	.914	100.000						

Extraction Method: Principal Component Analysis.



Component Matrix[a]

	Component			
	1	2	3	4
A26	.752	-.140		-.360
A25	.734	-.367		
A14	.724		-.143	.399
A29	.718	-.388	.254	
A19	.687	-.121		-.183
A30	.663		.383	-.215
A4	.658	.316	.108	-.285
A20	.645	-.161	.124	
A23	.636	-.319	-.333	
A22	.614	-.517		
A28	.605	-.284	.466	
A9	.598	.325	-.271	-.164
A8	.580	.332		-.183
A15	.579		-.309	.162
A16	.576	.252		.279
A10	.574	.300	-.535	-.127
A12	.549	.118	-.156	.156
A1	.494	.438		-.115
A11	.436	.492	.395	.144
A13	.548	.177		.611

Extraction Method: Principal Component Analysis.
a. 4 components extracted.

Rotated Component Matrix[a]

	Component			
	1	2	3	4
A29	.800	.209		.216
A22	.750		.230	.172
A25	.735		.295	.203
A28	.694	.322	-.199	.196
A26	.626	.364	.439	
A23	.586		.506	.133
A19	.575	.344	.261	
A20	.563	.255	.132	.241
A4	.267	.674	.308	
A11		.658		.410
A30	.491	.623		
A1		.604	.238	.184
A8	.179	.578	.313	.132
A10		.261	.788	.164
A9	.130	.428	.585	.150
A15	.307		.476	.364
A13	.175	.181		.799
A14	.417	.118	.341	.632
A16	.175	.353	.201	.528
A12	.229	.208	.357	.376

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

a. Rotation converged in 10 iterations.

Component Transformation Matrix

Component	1	2	3	4
1	.662	.479	.426	.389
2	-.712	.642	.191	.211
3	.201	.472	-.858	.017
4	-.123	-.368	-.214	.897

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

Extraction on three factor solution

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.776	38.878	38.878	7.776	38.878	38.878	4.461	22.307	22.307
2	1.748	8.742	47.620	1.748	8.742	47.620	3.323	16.615	38.922
3	1.260	6.299	53.919	1.260	6.299	53.919	2.999	14.997	53.919
4	1.068	5.340	59.260						
5	.965	4.825	64.084						
6	.882	4.409	68.494						
7	.856	4.280	72.774						
8	.725	3.626	76.399						
9	.689	3.445	79.845						
10	.601	3.005	82.850						
11	.518	2.589	85.439						
12	.497	2.487	87.926						
13	.455	2.276	90.202						
14	.414	2.068	92.271						
15	.395	1.973	94.244						
16	.288	1.438	95.682						
17	.252	1.260	96.942						
18	.227	1.134	98.075						
19	.202	1.011	99.086						
20	.183	.914	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
A26	.752	-.140	
A25	.734	-.367	
A14	.724		-.143
A29	.718	-.388	.254
A19	.687	-.121	
A30	.663		.383
A4	.658	.316	.108
A20	.645	-.161	.124
A23	.636	-.319	-.333
A22	.614	-.517	
A28	.605	-.284	.466
A9	.598	.325	-.271

A8	.580	.332	
A15	.579		-.309
A16	.576	.252	
A10	.574	.300	-.535
A12	.549	.118	-.156
A13	.548	.177	
A1	.494	.438	
A11	.436	.492	.395

Extraction Method: Principal Component Analysis.
a. 3 components extracted.

Rotated Component Matrix[a]

	Component		
	1	2	3
A29	.816	.241	
A22	.752		.284
A25	.736	.108	.351
A28	.719	.358	-.136
A26	.586	.263	.424
A20	.577	.294	.195
A23	.570		.538
A19	.561	.308	.282
A11		.766	
A4	.250	.620	.313
A1		.609	.266
A30	.490	.591	
A8	.171	.557	.331
A16	.222	.497	.316
A13	.262	.444	.263
A10		.244	.802
A9	.111	.406	.600
A15	.321	.148	.553
A14	.469	.298	.486
A12	.250	.295	.436

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 10 iterations.

Component Transformation Matrix

Component	1	2	3
1	.674	.530	.514
2	-.697	.686	.207
3	.243	.497	-.833

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

Rerun factor analysis on 16 items

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.118	38.240	38.240	6.118	38.240	38.240	3.647	22.796	22.796
2	1.645	10.280	48.520	1.645	10.280	48.520	2.681	16.755	39.551
3	1.124	7.026	55.546	1.124	7.026	55.546	2.559	15.995	55.546
4	.927	5.795	61.340						
5	.901	5.632	66.972						
6	.812	5.074	72.046						
7	.741	4.631	76.678						
8	.657	4.108	80.786						
9	.572	3.577	84.363						
10	.508	3.176	87.539						
11	.460	2.873	90.412						
12	.400	2.501	92.913						
13	.357	2.232	95.145						
14	.307	1.918	97.063						
15	.260	1.627	98.690						
16	.210	1.310	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
A29	.716	-.461	-.102
A25	.710	-.362	.135
A30	.698		-.392
A19	.692	-.144	
A4	.692	.278	-.145
A20	.652	-.230	
A28	.621	-.396	-.349
A8	.594	.314	
A22	.590	-.507	.194
A9	.588	.366	.224
A16	.588	.197	
A10	.584	.367	.521
A15	.573		.384
A12	.543		.116
A1	.511	.406	-.124
A11	.478	.393	-.498

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
A29	.716	-.461	-.102
A25	.710	-.362	.135
A30	.698		-.392
A19	.692	-.144	
A4	.692	.278	-.145
A20	.652	-.230	
A28	.621	-.396	-.349
A8	.594	.314	
A22	.590	-.507	.194
A9	.588	.366	.224
A16	.588	.197	
A10	.584	.367	.521
A15	.573		.384
A12	.543		.116
A1	.511	.406	-.124
A11	.478	.393	-.498

Extraction Method: Principal Component Analysis.
a. 3 components extracted.

Rotated Component Matrix[a]

	Component		
	1	2	3
A29	.826	.208	.102
A22	.761		.237
A25	.738		.317
A28	.726	.355	-.104
A20	.604	.184	.289
A19	.567	.258	.337
A11		.792	
A30	.490	.629	
A4	.264	.610	.368
A1		.567	.344
A8	.169	.542	.371
A10		.156	.845
A9	.112	.355	.626
A15	.350		.592
A12	.284	.264	.410
A16	.246	.402	.404

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

Component Transformation Matrix

Component	1	2	3
1	.669	.532	.519
2	-.742	.523	.420
3	-.048	-.666	.745

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

Appendix K: Factor analysis for logistics performance

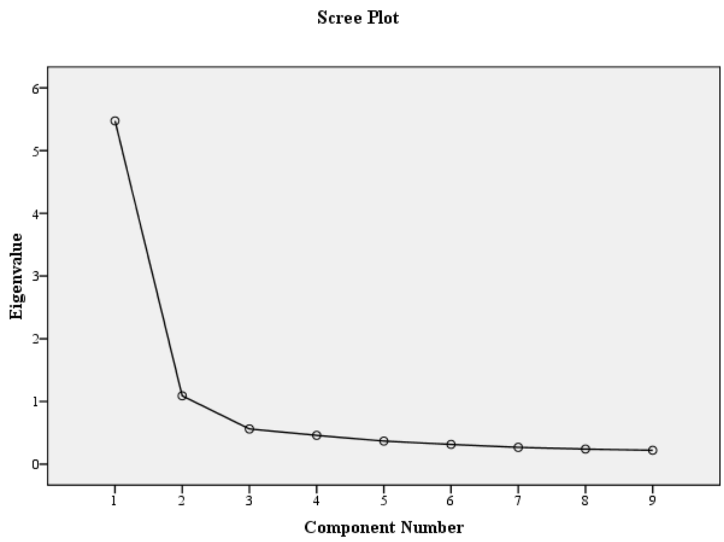
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.908
Bartlett's Test of Sphericity	Approx. Chi-Square	687.003
	df	36
	Sig.	.000

Anti-image Matrices

		B1	B2	B3	B4	B5	B6	B7	B8	B9
Anti-image Covariance	B1	.470	.016	-.052	-.257	-.060	.032	-.014	-.024	.034
	B2	.016	.375	-.127	-.018	-.070	.023	-.066	-.063	-.014
	B3	-.052	-.127	.391	-.001	-.018	.009	-.038	-.049	-.076
	B4	-.257	-.018	-.001	.446	.008	.032	-.123	.013	-.040
	B5	-.060	-.070	-.018	.008	.317	-.085	.027	-.100	-.072
	B6	.032	.023	.009	.032	-.085	.454	-.132	-.076	-.063
	B7	-.014	-.066	-.038	-.123	.027	-.132	.418	-.028	-.044
	B8	-.024	-.063	-.049	.013	-.100	-.076	-.028	.289	-.059
	B9	.034	-.014	-.076	-.040	-.072	-.063	-.044	-.059	.397
Anti-image Correlation	B1	.824[a]	.039	-.122	-.561	-.156	.068	-.032	-.065	.080
	B2	.039	.926[a]	-.333	-.045	-.205	.055	-.166	-.191	-.036
	B3	-.122	-.333	.935[a]	-.003	-.051	.021	-.093	-.144	-.193
	B4	-.561	-.045	-.003	.812[a]	.023	.071	-.286	.037	-.094
	B5	-.156	-.205	-.051	.023	.917[a]	-.223	.075	-.331	-.204
	B6	.068	.055	.021	.071	-.223	.911[a]	-.303	-.211	-.149
	B7	-.032	-.166	-.093	-.286	.075	-.303	.918[a]	-.081	-.107
	B8	-.065	-.191	-.144	.037	-.331	-.211	-.081	.926[a]	-.175
	B9	.080	-.036	-.193	-.094	-.204	-.149	-.107	-.175	.946[a]

1. Measures of Sampling Adequacy (MSA)



Total Variance Explained: Performance

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
	5.474	60.821	60.821	5.474	60.821	60.821	4.386	48.733	48.733
2	1.089	12.105	72.926	1.089	12.105	72.926	2.177	24.194	72.926
3	.562	6.242	79.169						
4	.460	5.115	84.283						
5	.368	4.093	88.376						
6	.315	3.501	91.877						
7	.268	2.980	94.857						
8	.242	2.684	97.541						
9	.221	2.459	100.000						

Extraction Method: Principal Component Analysis.

Appendix L: Reliability

Technology resource

Case Processing Summary

		N	%
Cases	Valid	120	97.6
	Excluded[a]	3	2.4
	Total	123	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.816	.825	5

Item Statistics

	Mean	Std. Deviation	N
A27	3.97	.777	120
A5	3.88	1.017	120
A21	4.00	.635	120
A6	4.13	.709	120
A7	3.96	.793	120

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
A27	15.97	6.268	.583	.382	.787
A5	16.06	5.299	.599	.388	.795
A21	15.93	6.819	.578	.417	.792
A6	15.80	6.229	.680	.571	.762
A7	15.98	5.974	.654	.553	.765

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
19.93	9.138	3.023	5

Physical resource

Reliability Statistics

Cronbach's Alpha	N of Items
.747	4

Item Statistics

	Mean	Std. Deviation	N
A17	4.40	.713	121
A3	4.17	.789	121
A24	4.13	.682	121
A2	4.09	.827	121

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
A17	12.39	3.306	.530	.696
A3	12.62	3.121	.518	.704
A24	12.65	3.345	.551	.687
A2	12.69	2.881	.578	.669

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
16.79	5.187	2.277	4

Organizational Resource

Case Processing Summary

		N	%
Cases	Valid	120	97.6
	Excluded[a]	3	2.4
	Total	123	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.847	6

Item Statistics

	Mean	Std. Deviation	N
A20	4.14	.714	120
A22	4.38	.663	120
A25	4.32	.686	120
A19	4.18	.648	120
A28	3.96	.738	120
A29	4.23	.618	120

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
A20	21.08	6.709	.594	.829
A22	20.83	6.880	.602	.827
A25	20.90	6.629	.656	.817
A19	21.03	6.974	.591	.829
A28	21.26	6.664	.579	.833
A29	20.98	6.571	.777	.797

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
25.22	9.415	3.068	6

Relational Resource

Case Processing Summary

		N	%
Cases	Valid	122	99.2
	Excluded[a]	1	.8
	Total	123	100.0

a. Listwise deletion based on all variables in the procedure.

Item Statistics

	Mean	Std. Deviation	N
A9	3.79	.826	122
A10	3.94	.719	122
A15	4.23	.736	122

Reliability Statistics

Cronbach's Alpha	N of Items
.670	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
A9	8.17	1.433	.522	.522
A10	8.02	1.587	.576	.458
A15	7.73	1.868	.366	.717

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
11.96	3.147	1.774	3

Management expertise

Case Processing Summary

		N	%
Cases	Valid	121	98.4
	Excluded[a]	2	1.6
	Total	123	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.707	4

Item Statistics

	Mean	Std. Deviation	N
A1	4.00	.785	121
A4	3.90	.907	121
A8	3.78	.790	121
A11	3.69	.865	121

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
A1	11.37	3.952	.454	.667
A4	11.47	3.335	.551	.605
A8	11.60	3.760	.522	.627
A11	11.68	3.737	.449	.671

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
15.37	5.986	2.447	4

Customer Service Innovation

Case Processing Summary

		N	%
Cases	Valid	120	97.6
	Excluded[a]	3	2.4
	Total	123	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.917	6

Item Statistics

	Mean	Std. Deviation	N
B8	4.08	.700	120
B5	3.99	.704	120
B9	4.15	.682	120
B6	3.91	.745	120
B2	3.90	.738	120
B3	4.00	.710	120

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
24.02	12.932	3.596	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
B8	19.95	8.939	.837	.891
B5	20.03	9.007	.811	.895
B9	19.88	9.287	.766	.902
B6	20.12	9.297	.678	.914
B2	20.12	9.035	.756	.903
B3	20.02	9.218	.745	.904

Cost

Case Processing Summary

		N	%
Cases	Valid	122	99.2
	Excluded[a]	1	.8
	Total	123	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.817	2

Item Statistics

	Mean	Std. Deviation	N
B1	3.56	.834	122
B4	3.61	.829	122

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
B1	3.61	.687	.691	.[a]
B4	3.56	.695	.691	.[a]

a. The value is negative due to a negative average covariance among items. This violates reliability model assumptions. You may want to check item codings.

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
7.16	2.337	1.529	2