



An empirical examination of the contribution of capabilities to the competitiveness of logistics service providers

Logistics service
providers

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A perspective from China

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Abstract

Purpose – This paper aims to report on an investigation of logistics service provider (LSP) capabilities and how these capabilities contribute to LSP competitiveness in the context of China.

Design/methodology/approach – This paper draws on work from economics and strategy on firm-level competitiveness, particularly the resource-based view, to develop and empirically examined 13 firm-specific capability constructs based on a survey of Chinese LSPs.

Findings – Exploratory factor analysis and factor analysis regression indicated all 13 constructs are critical to a Chinese LSP's competitiveness and are interlinked in contributing to it. The findings also revealed the most critical capability is service quality; this capability was further assessed and two sub-constructs of operations and relationship management emerged.

Practical implications – The results of the empirical study provide a useful way for LSP managers to identify and appraise their firm's capabilities and competitiveness.

Originality/value – This study contributes by addressing a gap of empirical research concerning LSP competitiveness and capabilities.

Keywords Distribution management, Competitive advantage, China

Paper type Research paper

1. Introduction

Logistics service providers (LSPs) provide multiple logistics services for customers comprising *inter alia* transportation, warehousing, cross-docking, inventory management,

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packaging and freight forwarding. The emergence of LSPs is closely associated with the outsourcing phenomenon of the early 1980s. Firms, usually manufacturers or retailers, have tended to outsource all or part of their logistics activities previously performed in-house to one or more specialty firms or LSPs in order to concentrate on their core competences.

LSPs have developed rapidly during the last two decades and have grown in importance as a result of both demand and supply pressures, such as international supply and distribution networks caused by the globalization economy, advanced information technology (IT) and the advent of the e-commerce society, industry restructuring, mergers and acquisitions, higher customer service expectation and decreasing price and margins. On the other hand, due to challenges from these pressures and economic turbulence, LSPs have not stopped seeking new ways to provide superior performance in order to differentiate themselves from competitors and safeguard their competitive positions. A basic issue then is: in a rapidly changeable business environment how can an LSP compete successfully and does it have the internal factors or capabilities to do so?

This paper considers LSP competitiveness to address this issue. The topic of competitiveness in business research is not new, where various discussions on firm-level competitiveness have been ongoing since the early 1980s. However, in the logistics and supply chain management (SCM) field, the competitiveness of LSPs still remains largely under researched. This may be partly seen from study results found by Maloni and Carter (2006) and Selviaridis and Spring (2007) of journal papers regarding LSPs published in the period 1989-2004 and 1990-2005, respectively. Despite a wide range of issues being discussed in both papers, no topic relating to LSPs' competitiveness was clearly addressed. This paper will thus help to fill this void in the LSP literature.

Differing from most previous studies that use conceptual approaches limited to the analysis of concepts or indicators, this paper seeks a deeper understanding of the internal sources of competitiveness in the LSP market by digging beneath standard concepts and indicators. To fully address this issue, this paper used the work of economics and strategy, in particular the resource-based view (RBV) of the firm, as its theoretical background. This was achieved by examining the linkages between an LSP's competitiveness and the capabilities it possesses. Specifically, the study reported in this paper addressed four research questions:

- RQ1.* What firm-specific capabilities are critical to an LSP's competitiveness?
- RQ2.* To what extent can an LSP's firm-specific capabilities contribute to its competitiveness?
- RQ3.* What firm-specific capability is the most critical to an LSP's competitiveness?
- RQ4.* How can we assess the relative attributes of the most critical capability?

The paper is organised into five sections including this introduction. The next section discusses the relevant literature that informed the study. Section 3 describes the research method used to investigate the above research questions while the Section 4 presents an analysis and interpretation of the study results. Finally, the paper concludes with a discussion of implications and directions for future research.

2. Theoretical underpinnings and development of constructs

Firm-level competitiveness

Firm-level competitiveness is also referred to as micro-economic competitiveness. Various government bodies and authors have offered different perspectives of competitiveness at this level. For example, The Organization for Economic Cooperation and Development (OECD, 1992, p. 239) linked competitiveness at this level to the capacity of firms in competition:

In micro-economics, the term “competitiveness” refers to the capacity of firms to compete and, on the basis of their success or “competitiveness”, to gain market shares, increase their profits and grow.

Altenburg *et al.* (1998, II) delineated firm-level competitiveness and place emphasis on the firm’s ability to sustain itself:

At the company level, competitiveness refers to the ability to sustain a market position. This ability requires the simultaneous achievement of several targets. The firm must supply products of adequate quality on time and at competitive prices. Moreover, it must as a rule be in a position to provide sufficiently diversified products to meet a differentiated demand, and it must respond quickly to changes in demand behavior. Beyond this, success is contingent on a firm’s innovative capacity, its ability to build up an effective marketing system, to establish a brand name, and so on.

Prahalad and Hamel (1990, p. 81) suggested that a firm’s competitiveness may originate from core competences which reside in the firm. They stated that competitiveness applies to two time scales:

In the short run, a company’s competitiveness derives from the price/performance attributes of current products. In the long run, competitiveness derives from an ability to build, at lower cost and more speedily than competitors, the core competencies that spawn unanticipated products.

Hitt *et al.* (2003) proposed a concept of strategic competitiveness on the basis of a strategic management standpoint, meaning how firms use resources, capabilities, and core competences arising from capabilities to create strategic competitiveness.

In general, these discussions argue that firm-level competitiveness is related to the ability or capacity that firms possess to use resources, sustain market position, outperform competitors and react to the competitive environment. The achievement of competitiveness, to a large extent, relies on building important capabilities such as superior product/service quality or competitive price/cost. These discussions provide a conceptual sense for understanding firm-level competitiveness and are helpful in comprehending the contribution of capabilities to competitiveness when adopting the RBV approach.

The RBV

The origin of the RBV is from Penrose (1959), who defined a firm as a collection of resources whose growth is limited by its resource endowment. As the nature and range of these resources vary from firm to firm, so do the respective resource constraints. The RBV suggests that a firm’s resources and its capability to convert these resources to provide sustainable competitive advantage are the keys to superior performance (Barney, 1991; Grant, 1991; Wernerfelt, 1984).

In general, resources are referred to as physical, financial, individual and organizational capital attributes for a firm (Amit and Schoemaker, 1993). Resources are necessary inputs for producing the final product or service and form the basis for a firm's profitability (Amit and Schoemaker, 1993; Grant, 1991). They may be considered both tangible assets such as plants and equipment and intangible assets such as brand names and technological know-how (Collis and Montgomery, 1995; Fahy, 2000). Resources can also be traded however few resources are productive by themselves. They only add value when they are converted into a final product or service (Amit and Schoemaker, 1993; Day, 1994; Grant, 1991).

In contrast, capabilities refer to:

[...] a firm's capacity to deploy resources, usually in combination, using organizational processes, to effect a desired end. They are information-based, tangible or intangible processes that are firm-specific and are developed over time through complex interactions among the firm's resources (Amit and Schoemaker, 1993, p. 35).

Unlike resources, capabilities cannot be given a monetary value and traded (Day, 1994). In addition, capabilities are deeply embedded in the organizational routines and practices (Day, 1994; Grant, 1991).

Capabilities are emphasized as being more likely to be the most important source of competitive advantage as it is hard to duplicate/replicate by contrast with resources. Grant (1991) stressed that capabilities are the main source of a firm's competitive advantage, and resources are the source of these capabilities. Collis (1994) also maintained that capabilities are the most likely source of sustainable competitive advantage. Teece *et al.* (1997) distinguished capabilities from resources by emphasizing capabilities being dynamic, resulting from the requirements of a changing environment to strategic management.

In addition, this array of empirical studies building on the RBV demonstrates that a rational explanation of the sources of a company's competitiveness should be firm-specific. They also agree that, in particular, capabilities play the most important role in determining competitiveness. We have thus selected the RBV to provide insights into this study, where the contribution of the capabilities an LSP possesses to its competitiveness is explored under this theoretical umbrella.

Development of constructs related to LSPs

Building upon the work of economists and strategists on firm-level competitiveness, in particular, RBV from strategic management, we thus argue that an LSP's competitiveness is derived from firm-specific capabilities and their intrinsic attributes to outform its rivals and achieve superior performance.

Capabilities have been discussed in some logistics and SCM studies (e.g. The Michigan State University Global Logistics Research Team, 1995; Morash *et al.*, 1996; Zhao *et al.*, 2001). However, despite discussions of the impact of capabilities on a firm's competitive advantage, these studies only investigated manufacturing and industrial firms and did not consider LSPs.

LSP capabilities have also received some attention in the literature. Lai (2004) applied an RBV approach to examine different types of LSPs according to different service capabilities posited that LSPs with better service capabilities may lead to better service performance. In that study, service capability was identified as a critical resource for LSPs to attain competitive advantage. Again using RBV as a theoretical foundation

Autry *et al.* (2005) empirically examined the impact of capabilities related to a warehouse management system on the performance of modern warehousing firms and distribution centres. These two studies provide evidence regarding the significance of some specific capabilities to organizational performance and also suggest that the RBV is a useful perspective to view an LSP's capabilities. Nonetheless, they tended to focus on the impact of one capability on an LSP's performance.

A firm's success or competitiveness to a great extent cannot be attributed to just one factor. For instance, Kay (1993) affirmed three distinctive capabilities for a firm's success: innovation, architecture and reputation. The OECD (1992) also suggested six contributing factors necessary to a firm's competitiveness, highlighting the capabilities of a firm possesses in six facets: management, organization, research and development (R&D) and innovation, strategy, relationships and human resource management (HRM). Finally, Gunasekaran and Ngai (2004) investigated the combined effect of several critical factors to an LSP's success: strategic alliances, IT; networking and relationship management; key performance indicators for management control; customer relationship management (CRM); joint ventures (JV); and innovation and benchmarking.

On the basis of these latter literature discussions and informal consultation with LSP professionals and academic experts, we argue that an LSP's competitiveness is likely to receive contributions from 13 firm-specific capabilities: strategic management, operations management, service quality, IT, service network, CRM, innovation, marketing, inventory management, HRM, corporate culture, business process management (BPM) and cost management. Definitions of these firm-specific capabilities are provided in Table I.

The first 12 capabilities identified above have been discussed by authors in consideration of factors contributing to LSP success (Harding, 1998; Chapman *et al.*, 2003; Gunasekaran and Ngai, 2003, 2004; Flint *et al.*, 2005; Pannayides and So, 2005; Lai, 2004; Wang *et al.*, 2006; Yeung *et al.*, 2006). These factors are recognized by LSPs in improving and sustaining with the aim of achieving success and superior performance. With regard to the 13th capability, cost management, the accounting and control of logistics costs has been identified as vital to companies seeking and improving competitive advantages (Goldsby and Closs, 2000; Pohlen and La Londe, 1994; Stapleton *et al.*, 2004). Accordingly, we have also included cost management as one of the important capabilities.

The 13 firm-specific capabilities comprise the underlying constructs of the research objective of this study, i.e. the competitiveness of LSPs. Each capability acts upon competitiveness through its intrinsic attributes. These attributes constitute the dimensions of the capability constructs. For example, the attributes of operations management capability might be pertinent to quality, speed, flexibility, specialization and standardization. With respect to service quality capability, delivery reliability, responsiveness, accuracy and communication are more likely to be considered. The attributes involved each capability may vary in their relative importance given their individual contributions. Some attributes are more important in leading to the achievement of competitiveness.

3. Research methodology

Research context, data collection and survey instrument

A survey for investigating the competitiveness of LSPs and the firm-specific capabilities they possess was conducted in China. The 13 capability constructs and variables

No	Capability	Definitions in this study
1	Strategic management	Successfully formulate strategies based on customer demands and market changes
2	Operations management	Successfully implement strategic planning and effectively/efficiently convert input to output for value creation
3	Service quality	Successfully deliver services matched to customers' expectations
4	Customer relationship management	Successfully identify, attract and retain the most valuable customers through a set of approaches
5	Information technology	Successfully support business and operation by applying a series of hardware, software, databases and other devices
6	Service network	The capacity to provide a wide range of services for customers over a wide area
7	Business process management	Successfully manage and control the process of delivering high quality standards of services consistently without functional barriers
8	Marketing	Successfully build a set of processes for creating, communicating and delivering value to customers and managing customer relationships in ways that benefit the company
9	Inventory management	The ability to provide a supplementary service of managing inventory for customers
10	Innovation	The ability to develop anything new to facilitate the company's business, operation and service offerings
11	Human resource management	Successfully invest human resources by adopting a set of means, e.g. staff training, performance measurement
12	Cost management	The ability to control and improve activities, processes and services by adopting a set of costing techniques and methods
13	Corporate culture	Successfully provide a set of values and beliefs that define the way in which a firm conducts its business

Table I.
Firm-specific capability
constructs for LSPs

that underlie them were developed from the literature and thus an explanatory approach was considered appropriate (Churchill, 1979).

China is a developing country with a high rate of economic growth. There are mainly two reasons why this research context was selected. First, it is possible to investigate the issue in relation to competition in China in that the competitive environment in China has been established in the circumstance of a market-orientated economic system. China was founded in 1949 and historically operated a centrally planned economy for a long time. Since reform and opening-up policies were taken in 1978, China has been undergoing its transition from centrally planned economy to the market economy. As a result of this transformation, today's business environment in China has radically been changed: the government's intervention to a large extent has reduced and companies are likely to run their business in terms of market rules. Competitiveness has since become a fundamental belief and aim that companies pursue.

Second, competition in an emerging but accelerating Chinese logistics service market is robust and very active but of course, relatively recent. Further, the provision of logistics services in China is a nascent market. However, influenced by the whole macro-economic progress the logistics service market is growing rapidly. In this market,

different types of LSPs are emerging which are interdependent, mutually promotional and competitive. In response to the economic transformation and China's accession to the World Trade Organization, some LSPs have built strategic partner relationships with foreign LSPs in order to exploit their native advantages in China, such as network, equipment and low-labour cost. Some small- and middle-sized LSPs are being absorbed by larger LSPs. In addition, many LSPs are restructuring their organizations and businesses, expanding their service portfolio and geographical coverage. As reported by China Communication and Transportation Association (CCTA, 2006) each LSP is keen on its market place by tapping its potentials in this emerging but rapidly expanding market.

To clarify whether the 13 firm-specific capabilities developed essentially contribute to an LSP's competitiveness in the current logistics service market, i.e. establish content and face validity, as well as to explore some other capabilities having not discussed in the literature, 21 face-to-face interviews were conducted with Chinese LSP professionals prior to a questionnaire survey being undertaken for the main study (Churchill, 1979). The semi-structured interviews included both open- and closed-ended questions that explored themes of the impact of capabilities on competitiveness, the importance of firm-specific capabilities in contributing to competitiveness, and the assessment or performance of each firm-specific capability. The interview results revealed that the 13 capabilities all provided contributions to an LSP's competitiveness. In addition, interviewees did not identify any other capabilities that could be used for further investigation and many emphasized that different firm-specific capabilities, acting together, impacted on the competitiveness of LSPs.

The interviews helped to refine the design of the questionnaire used for the main survey. The questionnaire was composed of four parts. The first part was concerned with the sources of competitiveness and the importance of firm-specific capabilities to competitiveness. The second and third parts were pertained to the assessment and performance of each firm-specific capability. The last part was the background information by responding companies. The enquiries were used by either an attitude measurement on a five-point Likert scale or closed questions, as shown in the Appendix. The questionnaire was pre-tested with three Chinese LSPs. The aim of the pre-test was to detect any possible shortcomings and after pre-testing and minimal revisions the final version of the questionnaire was prepared and distributed.

Sampling, survey administration, response rate and non-response bias

The administration of the questionnaire was conducted in conjunction with the CCTA. CCTA is the most authoritative and influential organization in the Chinese logistics and transportation community. Since 2004 and jointly with eight influential associations[1] in China, CCTA has run a survey of the Top 100 Chinese LSPs. This survey is held in high regard by Chinese logistics companies. COSCO Logistics has successively ranked first among the Top 100 Chinese LSPs for three years. China Post Logistics and China Shipping also ranked in the front among the Top 100.

CCTA agreed to participate and administer this study's questionnaire when they conducted their own annual survey. A Chinese version of the questionnaire was sent to CCTA by email and CCTA attached it to their survey. The document included a cover letter which outlined the purposes of the survey. Subsequently, CCTA distributed the questionnaire in three ways: hard copies by express mail, displayed at an exhibition in their conference entitled Senior Forum of 2006 China Top 100 Logistics Service

Providers and electronic copies via an internet survey through the authorized web site: www.56top100.com (Zhonguo Logistics *Baiqiang Qiye Wang*).

A total of 730 questionnaires were distributed. The survey in China took three-and-a-half months to complete owing to the broad coverage and strict procedures used in implementing the survey. A total of 114 completed questionnaires were returned overall: 111 postal and three from the internet. All 114 responses were usable however it is difficult to calculate a total response rate including the online version of the survey. The response rate for mail and exhibition modes was just over 15 per cent (111/730).

Non-response bias was examined using the extrapolation method (Armstrong and Overton, 1977; Lambert and Harrington, 1990), which compared early responses (77 returned in the first two months) with late responses (37 returned in the last one-and-a-half months) in terms of items surveyed in the sample. The test results are shown in Table II indicated that there was no bias included in the research since no significant differences were found at the 0.05 level.

Several statistical techniques were used to analyze the quantitative data including one sample *t*-test, correlation analysis, exploratory factor analysis (EFA) and factor regression analysis. All data analyses were conducted using SPSS 14.0.

4. Study findings

Respondent details

All respondents were from a background of transportation, warehousing, freight forwarding or integrated service provision. The history of all responding companies ranged from several years to several decades, but companies setting up within two and ten years accounted for over half of respondents. The responding companies also varied widely in size with number of employees ranging from fewer than 200 to 30,000. Regarding ownership, 93 per cent of respondents were almost equally split between state-owned enterprise and private companies. The remaining 7 per cent were JV firms with international partners. Respondents served a wide range of customers and household appliances, and industrial machinery and equipment were the two biggest sectors.

Variable	Early responses (77) mean scores		Late responses (37) mean scores		Mann-Whitney test Sig. (two-tail)	
	mean scores	SD	mean scores	SD	<i>z</i>	
Strategic management	4.56	0.734	4.65	0.597	-0.303	0.762
Operations management	4.52	0.644	4.71	0.519	-1.584	0.113
Service quality	4.79	0.522	4.89	0.315	-0.886	0.375
CRM	4.47	0.739	4.67	0.535	-1.277	0.202
IT	4.44	0.819	4.56	0.558	-0.216	0.829
Service network	4.37	0.830	4.47	0.609	-0.244	0.807
BPM	4.29	0.749	4.44	0.735	-1.093	0.274
Marketing	4.25	0.768	4.31	0.856	-0.560	0.575
Inventory management	4.01	0.841	4.17	0.878	-1.095	0.274
Innovation	4.44	0.698	4.62	0.594	-1.300	0.194
HRM	4.38	0.795	4.67	0.535	-1.721	0.085
Cost management	4.51	0.792	4.58	0.806	-0.439	0.661
Corporate culture	4.14	0.884	4.42	0.732	-1.488	0.137

Table II.
Non-response bias test

RQ1: firm-specific capabilities critical to competitiveness

All respondents were asked to assess the impact of capabilities on the competitiveness of an LSP based on a five-point Likert scale. This was scored from 1 – “no impact” to 5 – “high impact”. The one-sided *t*-test for capabilities with a *t*-value 29.28 and a *p*-value about zero indicates that the impact of capabilities on competitiveness is highly significant. The results are presented in Table III.

Further, respondents were asked to rate the importance of the 13 firm-specific capabilities in contributing to an LSP’s competitiveness using a five-point Likert scale from 1 – “unimportant” to 5 – “very important”. Table IV displays basic statistics of the 13 capabilities.

The results indicate that all 13 capabilities were considered substantially important according to their mean scores which are above the Likert scale mid-point. Service quality was the most important with a mean value very close to the maximum Likert point of 5. A one sample *t*-test showed the highly significant importance of all the 13 variables. This result indicates that the 13 firm-specific capabilities could be critical to an LSP’s competitiveness owing to their great importance perceived.

RQ2: contribution of firm-specific capabilities to competitiveness

In order to examine the extent to which firm-specific capabilities contribute to an LSP’s competitiveness, this study used statistical analysis in two steps. In the first step, EFA was carried out to explore the inter-relationship between the 13 capabilities. Next, factor analysis regression (FAR) was to make an inference about the relative contribution of the 13 capabilities to an LSP’s competitiveness.

Variable	Mean score	SD	Test value = 3	
			<i>t</i> -value	<i>p</i> -value
Capabilities	4.71	0.624	29.28	0.000

Table III.
Importance of capabilities by mean score and standard deviation

Variable	Mean score	SD	Rank	(Test value = 3)	
				<i>t</i> -value	<i>p</i> -value
Service quality	4.82	0.466	1	41.845	0.000
Strategic management	4.59	0.694	2	24.081	0.000
Operations management	4.58	0.612	3	27.129	0.000
Cost management	4.54	0.793	4.5	20.487	0.000
CRM	4.54	0.684	4.5	23.778	0.000
Innovation	4.50	0.669	6	23.957	0.000
IT	4.48	0.745	7	21.082	0.000
HRM	4.47	0.733	8	21.310	0.000
Service network	4.40	0.765	9	19.398	0.000
BPM	4.34	0.745	10	18.993	0.000
Marketing	4.27	0.794	11	16.901	0.000
Corporate culture	4.23	0.845	12	15.470	0.000
Inventory management	4.06	0.852	13	13.199	0.000

Table IV.
Importance of firm-specific capability constructs by mean score, standard deviation and ranking

Notes: 1 – unimportant; 5 – very important

EFA is a data reduction technique, the purpose of which is to identify the factor structure of a set of variables by determining the number and nature of common factors. EFA is particularly appropriate for use in an exploratory study when there is no prior theory on the inter-relationship between the variables (Stevens, 2002). EFA should only be performed on a sample size with 100 or larger (Hair *et al.*, 1998; Kline, 1979; Stevens, 2002), or in the case where the sample size is at least five times the number of variables to be analyzed (Hair *et al.*, 1998; Hatcher, 1994). In the current case, given that the underlying structure of the 13 capabilities was not known and the sample size was 114 with 13 variables, EFA was appropriate for this study. After data inspection on the sample a three-factor solution for the 13 variables after rotation is presented in Table V.

Table V shows that the three-factor solution accounts for almost 60 per cent of the total variance. The results of reliability test show the derived factors are reliable with α values of 0.79, 0.81 and 0.68. The three factors appear to have different characteristics. Factor 1 accounts for 41 per cent of the total variance and includes six variables: service quality, operations, CRM, inventory management, BPM and cost management, and tends to reflect operational attributes. Factor 2 accounts for 11 per cent with four variables: corporate culture, innovation, strategy and human resource, and is associated more with strategy considerations and issues. Factor 3 accounts for 9 per cent and the three underlying variables: IT, service network and marketing, are related to an LSP's network. The three factors have thus been named operational factor, strategic factor and networking factor, respectively, each of which addresses a theme common to the general discussion of LSPs. The results of EFA indicate that the 13 firm-specific capabilities are inter-related and can be factored into three categories in terms of common nature.

Variable	Factor 1	Factor 2	Factor 3	Communalities (h^2)
Service quality	<i>0.796</i>	0.174	-0.184	0.698
CRM	<i>0.719</i>	0.219	0.102	0.575
Operations management	<i>0.639</i>	0.051	0.247	0.472
Inventory management	<i>0.611</i>	0.248	0.347	0.555
BPM	<i>0.581</i>	0.301	0.350	0.551
Cost management	<i>0.516</i>	0.219	0.257	0.380
Corporate culture	0.244	<i>0.816</i>	0.190	0.762
Innovation	0.134	<i>0.759</i>	0.299	0.683
Strategic management	0.208	<i>0.730</i>	0.024	0.528
HRM	0.231	<i>0.696</i>	0.313	0.684
IT	0.095	0.231	<i>0.792</i>	0.690
Marketing	0.415	0.065	<i>0.725</i>	0.702
Service network	0.081	0.301	<i>0.632</i>	0.497
Kaiser-Meyer-Olkin measure of sampling adequacy			0.854	
Bartlett's test of sphericity (p -value)			0.000	
Initial Eigenvalues	5.280	1.380	1.117	
Variance explained (%)	40.615	10.615	8.594	
Cumulative variance (%)	40.615	51.231	59.824	
Coefficient alpha	0.79	0.81	0.68	

Table V.
EFA of firm-specific
capability constructs

Notes: Extraction method: principal component analysis; rotation method: Varimax with Kaiser normalization; factor loading level is 0.512; the factor loadings beyond this level are given in italic characters

The three factors were used as independent variables (IVs) in a regression model for capabilities. This approach is called FAR (Scott, 1966; Basilevsky, 1981; Kosfeld and Lauridsen, 2004). In an FAR, the three factors are uncorrelated with each other; each can make a separate contribution to explain the variance in the dependent variable (DV) (Stevens, 2002). More important, the relationship between the 13 variables and capabilities could be explored in this way, because all of the 13 variables are included in the model via the three factors.

Note that each factor is the linear combination of standardized values of the 13 variables multiplied by the corresponding factor score coefficients. This relationship can be used for calculating the factor scores, i.e. the values of a factor taken for all companies. The fitted regression with capabilities as DV and the three factors as IVs is presented as follows:

$$\text{Model FAR : } \hat{Y}_i = 0.319 F1_i + 0.260 F2_i + 0.284 F3_i,$$

where:

Y_i denotes the i th standardized value of capabilities.

$F1_i$ is the i th factor score of the operational factor obtained previously.

$F2_i$ is the i th factor score of the strategic factor obtained previously.

$F3_i$ is the i th factor score of the networking factor obtained previously.

This is a regression model without the constant term. In this case, the DV (Y) is the standardized score of capabilities. The p -value of the F -test for the whole model is 0.000 and the p -values of the t -test for each of the coefficients are 0.001, 0.007 and 0.004, respectively, indicating that the three factors all make a significant contribution to the capabilities. The value R^2 regarding this model is 0.249. The three predictors together account for 24.9 per cent of the variance in capabilities.

The results indicate that three factors are all positively related to capabilities and make contributions to capabilities, and hence competitiveness. The different contributions of the three factors suggest that an increase of one unit of each of them will cause 0.319, 0.260 and 0.284 increases in capabilities, respectively. Operational factor contributes slightly more to capabilities than the other two factors (i.e. strategic and networking factors). The results reveal that the 13 firm-specific capabilities contribute to competitiveness through the three factors.

RQ3 and RQ4: the most critical firm-specific capability and its assessment

As noted above service quality was identified by managers as the most important capability to contribute an LSP's competitiveness and falls into the operational factor with the largest factor score coefficient. This illustrates that service quality makes a significant contribution to competitiveness for LSPs.

In a logistics service context, the assessment of service quality is based on many attributes. Generally, it is suggested that it can be assessed using both operations-based and relationship-based definitions of customer services, as discussed by many authors (Grant, 2004; Harding, 1998; Mentzer *et al.*, 1989, 1999, 2001). Therefore, a deeper assessment of service quality was conducted using the nine customer service/quality variables underlying the service quality capability construct in the questionnaire:

staff conducts, billing accuracy, reliability of delivery, response time, IT support, customer loyalty/retention, value-added services, complaint/claims procedure and communication with client (see the Appendix). The aim of the analysis was to examine the extent to which service quality could be assessed by these attributes.

The process of choosing the nine customer service/quality variables was the same as that of the 13 firm-specific capability constructs. They were developed on the basis of referring to service quality and customer service literature, as well as discussions with professionals and interviews with 21 Chinese LSPs. Table VI presents a description of the nine customer service/quality variables.

This analysis also comprised two steps. An EFA was first conducted to explore the inter-relationship of the nine customer service attributes and the results are displayed in Table VII.

Table VI.
Description of customer service/quality variables

No	Customer service criteria	Descriptions
1	Staff conduct	The extent of politeness, friendliness and considerateness of staffs
2	Billing accuracy	The extent of correction of handling billing
3	Reliability of delivery	The ability to exactly meet like quoted dates and quantities of service designated by customers
4	Response time	The ability to promptly handle customer requests and needs
5	IT support	The ability to offer IT equipment for supporting services
6	Customer loyalty/retention	The extent of commitment to repurchase services by customers
7	Value-added services	The ability to satisfy customers by value-added services offerings
8	Complaint/claims procedure	The extent of availability and easiness of handling problems arising from customers
9	Communication with clients	The extent of keeping customers informed

Table VII.
EFA of customer service/quality variables

Variable	Factor 1	Factor 2	Communalities (h^2)
Staff conduct	<i>0.778</i>	0.092	0.614
Billing accuracy	<i>0.720</i>	0.143	0.539
Reliability of delivery	<i>0.705</i>	0.277	0.573
Response time	<i>0.602</i>	0.390	0.514
IT support	<i>0.591</i>	0.382	0.495
Customer loyalty/retention	0.081	<i>0.817</i>	0.667
Value-added services	0.319	<i>0.746</i>	0.659
Complaint/claims procedure	0.541	<i>0.642</i>	0.705
Communication with clients	0.328	<i>0.615</i>	0.486
Kaiser-Meyer-Olkin measure of sampling adequacy		0.865	
Bartlett's test of sphericity (<i>p</i> -value)		0.000	
Initial Eigenvalues	4.270	0.981*	
Variance explained (%)	47.449	10.903	
Cumulative variance (%)	47.449	58.351	
Cronbach coefficient alpha	0.78	0.79	

Notes: Extraction method: principal component analysis; rotation method: Varimax with Kaiser normalization; factor loading level is 0.550; the factor loadings beyond this level are given in italic characters

Two factors explained 58 per cent of the total variance at 47 and 11 per cent, respectively. All communalities were above 0.48. This indicates that the two factors make a good contribution to explanation. The results of reliability test show the derived factors are reliable with α values of 0.78 and 0.79. Factor 1 contains five variables: staff conduct, billing accuracy, reliability of delivery, response time and IT support. Factor 2 contains four variables: customer loyalty/retention, value-added services, complaint/claims procedure and communication with client. These two extracted factors are associated with the two types of measures, i.e. operations- and relationship-based measures, in terms of the discussions in the literature. Therefore, the two factors may be considered operations and relationship factors.

Next, regression analysis was used to examine which attributes are significant in assessing service quality capability. The weighted factor scores of the two factors were used in a multiple regression analysis to determine whether individual factors were significant predictors. The regression analysis was performed between service quality as DV and the extracted two factors as IVs. Factor scores were used into this analysis. The estimated regression model of service quality on the two factors is exhibited below:

$$\hat{Y}_i = 0.228 F1_i + 0.386 F2_i$$

where Y_i denotes the i th standardized value of service quality; $F1_i$ and $F2_i$ are the i th factor scores of the operations factor and relationship factor obtained. This is again a regression model without the constant term, i.e. the DV (Y) is the standardized score of service quality.

The value of R^2 for this model is 0.20. The p -value of the F -test for the whole model is 0.000 and the p -values of the t -test for each of the coefficients are 0.010 and 0.001, respectively, indicating that the two factors are both significant predictors of service quality. This suggests that the variables contained in the two factors may be part of a necessary and sufficient variable set that will account for a significant amount of the variance on service quality and therefore, are useful in determining the important attributes in assessing service quality capability. The variables include reliability of delivery, communication with clients, staff conduct, customer loyalty/retention, response time, IT support, value-added service, billing accuracy and complain/claims procedure.

5. Discussion and conclusions

The statistical analysis has substantiated the importance of 13 firm-specific capabilities to an LSP's competitiveness and reveals significance of research.

In terms of rankings, several capabilities (e.g. service quality, operations management, cost management and CRM) tend to a greater contribution than others (e.g. inventory management and marketing). Aggregately the 13 capabilities may be viewed within three categories. Each category comprises different specific capabilities which exert their contribution at different levels. In this study, strategic factor includes corporate culture, innovation, strategic management and HRM; operational factor includes service quality, CRM, operations management, inventory management, BPM and cost management; and networking factor includes IT, service network and marketing.

The identification of the importance of the 13 firm-specific capabilities, on the one hand, infers that an LSP is a bundle of firm-specific capabilities through which the LSP

could achieve competitiveness, as suggested by the RBV. On the other hand, these capabilities, to some extent, reflect the characteristics of LSPs. In general, LSPs differ from other service firms because of their unique final output. Diversified service offerings and logistics activities are required to support the process of value creation. Competition between LSPs is manifested in these final service offerings. The way for this achievement, as revealed by analyses, is made by different contributions resulted from various firm-specific capabilities performing in the logistics service setting. The interlinkage of these capabilities can give an LSP a unique competitiveness.

Of the 13 capabilities, service quality was perceived as the most important capability. This result indicates that service quality is paramount to LSPs in achieving and maintaining their competitiveness and likely to be a differentiator for an LSP to outperform its competition. In addition, the analysis of factor scores also indicates that the competitiveness of each LSP is built on different kinds of capabilities. Some LSPs may excel in performing capabilities at the operational level, while others may have excellent capabilities demonstrating at strategic or networking levels. The results, on the one hand, support Grant's (1991) argument that the most important capabilities possibly arise from an integration of individual functional capabilities; on the other hand, this finding also suggests that the competitiveness of an LSP needs those distinctive capabilities to outperform their competitors. This provides empirical evidence to the discussion of Day (1994) where distinctive capabilities are considered extremely important in supporting competitive position because they are valuable and hard to match.

The empirical analysis examined the assessment of service quality, the most critical capability to an LSP's competitiveness. The empirical evidence as to service quality could be assessed by both operations and relationships attributes supports the argument of many RBV researchers, where capabilities are recommended to be assessed through key attributes (Ray *et al.*, 2004). Indeed, compared with resources, capabilities are hard to delineate and touch. Even some capabilities are based on historical legacy, causal ambiguity and social complexity, making it very difficult to measure their effect on competitiveness (Barney, 1991). However, they could still be identified and appraised in an appropriate way, as demonstrated by the evidence, where nine customer service attributes were analyzed to be the measures in assessing an LSP's service quality capability. These attributes are operation-specific and can be evaluated through benchmarking. This result also suggests that an LSP's capabilities might be diagnosed by targeting realistic aims for improvement. This finding supports the argument concerning capabilities diagnosis by Day (1994).

Implications for managers

From a managerial perspective, three implications can be addressed based on the empirical results. First, to achieve and maintain competitiveness successfully, one of critical management tasks for managers is to identify capabilities and decide which capabilities are dictated to be chosen for competition. Further, given the different contributions of each capability to competitiveness managers should explore which capability offers the greatest leverage. In addition, the effect of an integration of many capabilities should also be concerned.

Second, this study provides an illuminating insight of how LSPs appraise the capabilities they possess and leverage their relative contribution to competitiveness. This process can be viewed in three steps:

- (1) identify three categories of capabilities: strategy, operations and network;
- (2) identify a common nature of capabilities underlying the three categories, similar to this study's investigation of the 13 firm-specific capabilities; and
- (3) identify key attributes to assess each capability.

Managers might employ this process to examine whether the company could do more than its competitors using its various capabilities in more detail, and how its capabilities can be identified and relative strengths are exploited as well.

Third, the assessment of service quality also suggests the necessity of building a set of assessment system of individual capabilities. This would help managers have a clear picture of the extent to which those individual capabilities execute and how they could be benchmarked based on realistic measures relative to that of competitors. This also could help an LSP find its strengths, weaknesses, opportunities and threats from the benchmarking and therefore provide a path for improvement.

Most importantly, while the 13 capabilities are familiar in an LSP's businesses and operations, the capabilities in nature are complex and largely interrelated, each being performed by different ways and could be judged further. Managers must develop them in unique ways and thus create unique difference.

Implications for researchers

The study draws on previous work of economists and management strategists, in particular, the RBV perspective to investigate an LSP's competitiveness on the basis of capabilities. From a research point of view, the results support the application of general theory on firm-level competitiveness and the RBV as a lens through which an LSP's competitiveness can be understood using capabilities in the logistics setting. This improves the understanding of an LSP's competitiveness. In addition, the study does not confine itself to conceptual aspects of an LSP's competitiveness, like many previous studies on firm-level competitiveness. Empirical investigation has been used to validate and extend the theory. This offers a useful way to investigate an LSP's competitiveness. The results also suggest that identifying various capabilities and the inherent complexity arising from the capabilities may help LSPs better assess their own strengths and weaknesses, and compete successfully.

Limitations and directions for future research

The results of this study make a contribution to logistics knowledge. The study has transferred relevant theory from other disciplines to the logistics discipline, i.e. it reviewed and applied general research on competitiveness in the strategic management literature. It has also used the RBV, the most influential theory in strategic management to investigate the contribution of capabilities to an LSP's competitiveness. It has therefore strengthened the linkage between logistics research and strategic management, as called for by Olavarrieta and Ellinger (1997), where the potential of the RBV to be applied to logistics research was highly suggested.

Further, the applicability of the RBV was tested in the Chinese logistics industry. Given that most of the existing LSP literature is built on the Western perspective, the extension to Chinese setting in this study, markedly, is conducive to the development and advancement of logistics research since different perspectives are introduced.

However, as in all research studies there are some limitations that should be addressed in future research. First, this study has taken a static view of an LSP's capabilities, with no consideration of the acquisition and evolution of capabilities. Further research may explore, in much more detail, how capabilities develop in an LSP, and how they can be used to leverage resources inside the company to gain sustainable competitive advantage through time.

Second, given the variation in definitions of firm competitiveness and the confidentiality of financial information, competitiveness in this study is a perceived concept by companies. This might lead to the difference between managers when judging capabilities. Further research may confine and refine the concept of competitiveness and/or use financial information if possible.

Last, while the study empirically examined the assessment of the most critical capability, service quality, the other 12 capabilities have not been as deeply assessed. Further research should also investigate these capabilities using the same in-depth techniques applied to service quality.

Note

1. The eight associations are China International Freight Forwarders Association (CIFA), China Railway Society (CRS), China Association of Shipping Agency (CASA), China Shipowners' Association (CSA), China Ports & Harbors Association (CPHA), China Association of Port-of-Entry (CAOP), China Customs Brokers Association (CCBA) and China Air Transport Association (CATA).

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Further reading

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Appendix. The contribution of capabilities to the competitiveness of logistics service providers

Logistics service providers

❖ Please indicate to what extent the impact of capabilities on the competitiveness of a logistics service provider? *(Please rate on a scale of 1-5, 1= no impact, 5 = high impact)*

LSP's capabilities 1 2 3 4 5

❖ How important are the following factors in contributing to the competitiveness of an LSP? *(Please rate on a scale of 1-5, 1= unimportant, 5 = very important)*

- a. Strategic management 1 2 3 4 5
- b. Operations management 1 2 3 4 5
- c. Service quality 1 2 3 4 5
- d. Customer relationship management (CRM) 1 2 3 4 5
- e. Information technology (IT) 1 2 3 4 5
- f. Service network 1 2 3 4 5
- g. Business process management (BPM) 1 2 3 4 5
- h. Marketing 1 2 3 4 5
- i. Inventory management 1 2 3 4 5
- j. Innovation 1 2 3 4 5
- k. Human resource management 1 2 3 4 5
- l. Cost management 1 2 3 4 5
- m. Corporate culture 1 2 3 4 5
- n. Others (Please specify) _____ 1 2 3 4 5

❖ Please rate the importance of the following operational factors in terms of their impact on the competitiveness of an LSP: *(Rating scale on 1-5, 1= no importance, 5= high importance)*

- a. Quality of operation (failure rate) 1 2 3 4 5
- b. Speed of operation 1 2 3 4 5
- c. Flexibility 1 2 3 4 5
- d. Process integration 1 2 3 4 5
- e. Innovation 1 2 3 4 5
- f. Capacity utilization 1 2 3 4 5
- g. Standardization of operations 1 2 3 4 5
- h. Degree of specialization 1 2 3 4 5
- i. Others (please specify) _____ 1 2 3 4 5

❖ Please rate the importance of the following customer service factors in terms of their impact on the competitiveness of an LSP: *(Rating scale on 1-5, 1= no importance, 5= high importance)*

- a. Staff conduct 1 2 3 4 5
- b. Reliability of delivery 1 2 3 4 5
- c. Response time 1 2 3 4 5
- d. Billing accuracy 1 2 3 4 5
- e. Communication with client 1 2 3 4 5
- f. IT support 1 2 3 4 5
- g. Complaint/claims procedure 1 2 3 4 5
- h. Value-added services 1 2 3 4 5
- i. Customer loyalty/retention 1 2 3 4 5
- j. Others (please specify) _____ 1 2 3 4 5

(continued)

❖ Please rate the importance of the following aspects of human resource management in terms of their contribution to the competitiveness of an LSP. (1= no importance 5= high importance)

a. Staff recruitment procedures	1	2	3	4	5
b. Staff Training provision	1	2	3	4	5
c. Company ethos	1	2	3	4	5
d. Employee empowerment	1	2	3	4	5
e. Staff morale	1	2	3	4	5
f. Performance appraisal system	1	2	3	4	5
g. Reward and compensation system	1	2	3	4	5
h. Disciplinary procedures	1	2	3	4	5
i. Relations with trade union	1	2	3	4	5
j. Others (please specify) _____	1	2	3	4	5

❖ Which of the following attributes would you use to appraise the cultural characteristics of a logistics service provider? (Please tick appropriate boxes)

- Teamwork
- Quality service
- Relationships
- Quality of management
- Customer satisfaction
- Employee loyalty and morale
- Environmental and community responsibility
- Others (please specify) _____

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