

CAPABILITIES AND PERFORMANCE OF LOGISTICS SERVICE PROVIDERS IN FOUR COUNTRIES: SOME PRELIMINARY RESULTS

ABSTRACT

This paper presents initial results of a multinational study on the capabilities and performance characteristics of Logistic Service Providers (LSPs). The study considers operational, information technology and innovation capabilities as well as financial, operational, and innovation performance measures. The paper presents the overall results and describes some relationship between the firm's size, focus and capabilities on performance. It is observed that while the size of the firm does not relate to capabilities or performance, LSPs with a diversified set of functions (logistic services offered) have higher capability and performance levels. Finally, future steps of the research project are discussed.

KEYWORDS: Logistics Service Providers; 3PLs; Operational Capabilities and Performance

1. INTRODUCTION

A firm's ability to "play" in the global market place *is more often than not* based on having the "right" logistics. However, most firms do not have the necessary logistic systems, infrastructure or knowhow. Here is where logistic service providers (LSPs) 'come in'. LSPs are companies that provide their customers with transportation, warehousing, inventory management, procurement, and distribution services (among many). LSP's can be focused to provide one or a few services, for example transportation, while other LSPs are widely diversified organizations offering a large variety of logistic services and even some light manufacturing / value adding processes such as packaging. These companies play an important role in maximizing the efficiency of their customers as they allow those organizations to focus on their core competencies while LSPs themselves operate logistics processes as their core business.

The importance and role of LSPs in the business world is growing (Cheng & Lee, 2010) (Little, 2007) (Selviaridis & Spring, 2007) (Yeung, Zhou, Yeung, & Cheng, 2012) as these organizations take a higher percentage of activities typically performed *in-house*, and increase the diversity of functions they perform for their customers. Logistics is a competency within supply chain management, which possesses both strategic and structural capabilities that are focused exclusively on managing the activities solely used to fulfill customer orders (Stank, Keller, & Closs, 2001). The purpose of this paper is to present initial results related to a multinational study that analyzes the relation between the capabilities and performance of LSPs. In particular this paper aims to determine if there are relationships between LSPs' characteristics and their capability and performance levels. The study is based on data from four countries, two of these countries are in the Caribbean Sea region; Panama and Puerto Rico (commonwealth of the USA) and two in the Baltic Sea region; Finland and Russia. These countries represent various levels of industrial/logistic development and also provide two interesting *geographic positions*.

This research is based on the resource based view proposing that an organization's competitive advantage is obtained through a particular and unique set of capabilities and resources (Barney, 1991) (Rumelt, 1984) (Rumelt, 1991) (Wernerfelt, 1984). The paper analyzes a variety of the LSP firm's capabilities and systems including those related to information technology, operations, risk planning, and innovation. The analysis considers that a firm's performance is described by multiple dimensions including those that characterize financial, operational, and innovation results. This study explores several relationships which provide interesting directions for analysis, including the effects of innovation capabilities in the various dimensions of performance. The results presented in this paper are part of a larger study that includes data about environmental factors and long term partnerships among others. As a multinational study, another goal of our future studies

is to determine any possible differences among countries / regions in these relationships. This multi-regional/country perspective is in line with the work by (Liu & Lyons, 2011) who examined the relationships between capabilities and performance for 3PLs in Taiwan and the UK.

This paper provides descriptive statistics about the collected data, although it also discusses some interesting relationships between factors observed in our preliminary analysis. The remaining of this paper is organized as follows. Section 2 provides a theoretical background to the factors being considered in the study and presented in this report. Section 3 describes the general research methodology, focusing on describing the development of the survey instrument and the collection of the data. Section 4 presents descriptive statistics of the results and the relationships among a few variables. Section 5 summarizes the work, managerial implications, and discusses the next stages of this project.

2. THEORETICAL BACKGROUND AND HYPOTHESIS

This section analyses the resource based view's (RBV) relation with logistic systems' competitive performance. It also describes the relevance of the capability areas considered in this report; operational, information/technology, risk planning, and innovation. Finally it discusses the performance areas: financial, operational, and innovation.

2.1 Resource based view to creating logistics service capabilities

The resource based view RBV sees organizations from the perspective of how their tangible and intangible assets, systems and capabilities create value. Thus, the points of analysis are not companies' offerings, rather the system that creates those. The RBV argues that differences in firm performance are fundamentally due to firm heterogeneity rather than industry structure (Barney, 1991) (Rumelt, 1984) (Rumelt, 1991) (Wernerfelt, 1984). Firms can gain competitive advantage, if they are able to accumulate resources and capabilities that are rare, valuable, non-substitutable, and difficult to imitate. Accordingly, the RBV provides

a theory to explain competitive advantage as an outcome of the development of valuable organizational capabilities. These capabilities can have different forms, such as continuous innovation, organizational learning, and stakeholder integration, associated with a proactive environmental strategy (Sharma & Vredenburg, 1998).

The traditional theory of RBV has predicted that competitive advantage results from those resources and capabilities that are owned and controlled by a single firm. Consequently, the focus has been on those resources that are housed within the company. However, a firm's critical resources may extend beyond firm boundaries, and therefore (Dyer & Singh, 1998) created a relational view of competitive advantage that focuses on networks in order to understand competitive advantage. As the focus in RBV has been on capabilities owned by a firm, exogenous factors have traditionally been absent from the RBV literature. However, there has recently been growing interest to the influence of the market conditions under which different resources may be valuable (Barney, 1991) (Priem & Butler, 2001).

There is a relatively large literature in logistics services considering the RBV. The focus here is on how logistics related capabilities can be created and the relationship between these capabilities and performance. (Yeung, Zhou, Yeung, & Cheng, 2012) study the role of logistics outsourcing as a strategy to develop firms' capabilities. They find a positive relationship among the orientation towards third-party logistics (3PL) providers, 3PL providers' capabilities, competitive advantage and performance. Further, (Cheng & Lee, 2010) examine internal resources and capabilities, and identify information technology management as a priority concern in logistics service operations (reverse logistics in particular). (Lai, Wong, & Cheng, 2010) identified digitized logistics services bundles in firms affecting performance outcomes: essentially, those with the most extensive digitized bundles and utilizing these the most achieve best logistics performance.

(Sandberg & Abrahamsson, 2011) on their part analyzed two Swedish companies exploiting logistics capabilities to develop sustainable competitive advantage. This is based on a combination of excellent logistics operations and in-house developed IT-systems. The competitive advantage is sustained through five dynamic capabilities: managerial knowledge, cross-functional teamwork, learning, control and supply chain relationship management. Regarding dynamic capabilities, (Lu & Yang, 2010) identified three critical logistics service capabilities: innovation, customer response and flexible operations capabilities. The first two of these were deemed the most important to achieve highest performance, customer response capability playing the biggest role. This is supported by the results of (Liu & Lyons, 2011), stating that key priorities of customers should be directly reflected on the service capabilities of logistics providers. Building on this customer orientation, the next subsection presents the applied division of logistic capabilities to three distinctive groups.

2.2 Three types of logistic capabilities

A large number of papers have presented elements that describe an organization's logistic capabilities (for example (Chen & Paulraj, 2004) (Prajogo & Olhager, 2012)). These are related to the firm's resources that allow them to provide their customers with the transportation, inventory, and other logistics services they need. Capabilities are in many ways dependent to the specific services the LSP provides. A characterization provided by Lai et al. (2010), states that a "service capability is defined as the ability of logistics service providers to create and deploy resources to satisfy the logistics needs of their customers in pursuit of better service performance". This study considers three types of capabilities: operational, information, and innovation. The data collected on the firms appraises these three types of capabilities (Section 3.1).

The importance of the operational service capabilities of the firm, in essence the ability to provide the specific services customer require, for example the ability to transport the material, or to provide warehouse space, is obvious. These are the basic LSP capabilities

that are often tightly linked to the tangible assets of the firm. Multiple studies have described a variety of service capabilities those of (Liu & Lyons, 2011) (Lu & Yang, 2010) (Yeung, Zhou, Yeung, & Cheng, 2012).

Information technology related capabilities play an integral role in the delivery of logistic services, in particular real time visibility into processes and data. The capabilities also relate heavily to the interconnectivity of the LSP to its customers and its resources (Cheng & Lee, 2010) (Sandberg & Abrahamsson, 2011). In this study we consider information capabilities related to electronic based interaction with customers, ability to process invoices, information technology in support of “floor” operations, ability to track and trace, customs processing and management decision making. Information technology capabilities utilize both tangible and intangible resources from a firm.

Innovation capability items relate to the LSP ability to develop new systems and processes that improve their performance and/or that of their customers. The importance of innovation for LSP was examined by (Yang, Marlow, & Lu, 2009), who propose that innovation capability refers to the “firm’s ability to continuously transform knowledge and ideas into new products, processes, and systems for the benefit of the firm”. Innovation is of relevance in practice as demonstrated by the Arthur D. Little study on 3PL innovation (ELA/ADL, 2007).

2.3 Performance

It is recognized that accounting for a firm’s performance should include a variety of dimensions including financial and operational performance (Yang, Marlow, & Lu, 2009). Financial performance is typically classified as lagging indicators, while operational performance as leading indicators. Lagging serves to indicate past performance while leading serve to predict future performance (reference). Two financial indicators are considered in this study: gross profit margin and sales growth. In this study we subdivide operational performance measures in two types, the first related to logistic results, as for example those

related to lead time speed and accuracy, the second related to innovation, for example the ability to develop new services or processes. While logistic performance is a key indicator of perceived customer satisfaction, innovation performance is of significance as organizations face new challenges and competitors, thus the ability to create and improve processes essential for long term success.

3. METHODOLOGY

3.1 Survey instrument

The methodology used to develop survey instruments in operations management research is well known and includes two primary phases: item generation and pre-testing. This paper reports only on a subset of the items included in the questionnaire used in the study, future reports will describe and analyze the results for the other elements of the study. In this work we include the items related to operational capabilities, information/technology capabilities, innovation capabilities, supply chain risk planning processes, financial performance, operations performance, and innovation performance.

A great attention was given to instrumentation: existing and validated scales were used wherever possible, but modified to reflect our focus on LSPs. The operation and information/technology capabilities are based on (Chen & Paulraj, 2004) and (Liu & Lyons, 2011), and the innovation capabilities on a study by Arthur D. Little on 3PL innovation (ELA/ADL, 2007) and those in (Yang, Marlow, & Lu, 2009). The financial and operational performance measures are based on those used by (Liu & Lyons, 2011), while the innovation performance items are based on those used by (Liu & Lyons, 2011) and (Yang, Marlow, & Lu, 2009). For all items a seven-point Likert scale was used. The instrument was initially developed in English and translated to Finnish, Spanish, and Russian. It was pre-tested by practitioners in each of the countries of the study to ensure that the conceptualizations of the questions match the actual experience of the practitioners (Malhotra & Grover, 1998).

3.2 Sample and data collection process

This study is based on data collected from LSP firms having operations in Puerto Rico, Panama, Russia and Finland. The data was collected using online survey systems and the collection timeframe differed slightly among the four locations, with all data reported in this study collected between November 2014 and May of 2015. Data collection started in Finland, where the companies selected for the study were randomly drawn from a Finnish companies' database called Fonecta. In other countries, the list of companies was developed using publicly available directories and information from other sources as professional and academic organizations. The lists were developed by selecting organizations that were classified in one of these segments: freight forwarders, transportation, 3PLs (general definition), warehousing, distribution, and custom brokers. In general the process started by a call/email to companies to establish contact information for a high level executive (director, CEO,...) which was followed by an email inviting the contact to complete the survey (the email contained a link to the survey website). Nonresponses were followed by reminder emails/phone calls. It is important to point out that a drop exists between the number of companies in the original list and the actual potential candidates. The reason is that multiple companies on the original lists ceased to exist (or never answered their phones) or did not want to provide contact information for a high level director/manager (or provided incorrect information). A summary of the data collection dates, sample methods, and response rate is presented in Table 1. The overall response rate is considered satisfactory as response rates in these types of studies are typically low (Prajogo & Olhager, 2012).

Table 1. Summary of data collection results

	Finland	Russia	Panama	Puerto Rico
Source of company information database	Fonecta	Developed <i>in house</i> using open publications/ / professional and academic organizations		
Collection timeframe	11/14-1/15	1/15-3/15	Feb – May 2015	
# companies in original list	910	500+	135	159
Sample size	113	500	135	159
# of valid contacts/ surveys sent	108	500	126	98
Usable responses	52	39	35	37
Response rate	48%	8%	28%	38%

4. ANALYSIS AND RESULTS

This section first describes the profiles of the respondents, followed by the results obtained for the different capabilities and performance variables. The third component of this section presents some interesting relationships found between the capability and performance variables, and the LSPs' size (as defined by number of employees) and focus (as defined by the number of functions performed). At this stage, the analysis is 'exploratory', as the objective is to become more familiar with a topic (Malhotra & Grover, 1998).

4.1 A few characteristics

Two characteristics of the participating companies are presented in Table 2. The first relates to their size, based on number of employees. In general terms, the participating LSP are small businesses with 72% of those having less than 50 employees, and only 10% of them having more than 200 employees. Only in Panama did companies with more than 50 employees surpassed the smaller organizations, and by a very small margin (1.4%). The second characteristic reported here is the number of functions performed by the LSPs. Respondents were asked to select all that applied from a total of 18 choices. Figure 1 presents the percentage of time each function was selected (left) and the number of functions performed for the overall group and by country. The results illustrated in Figure 1 (left) are in line with expectations, where the most common functions are distribution, warehousing, and freight forwarding, while the least common are contract manufacturing and assembly/ installation. The first are traditional logistic services, while the last two are activities that LSPs have added to their portfolios typically at customers' request in support of mass customization strategies, but are not often their core competencies.

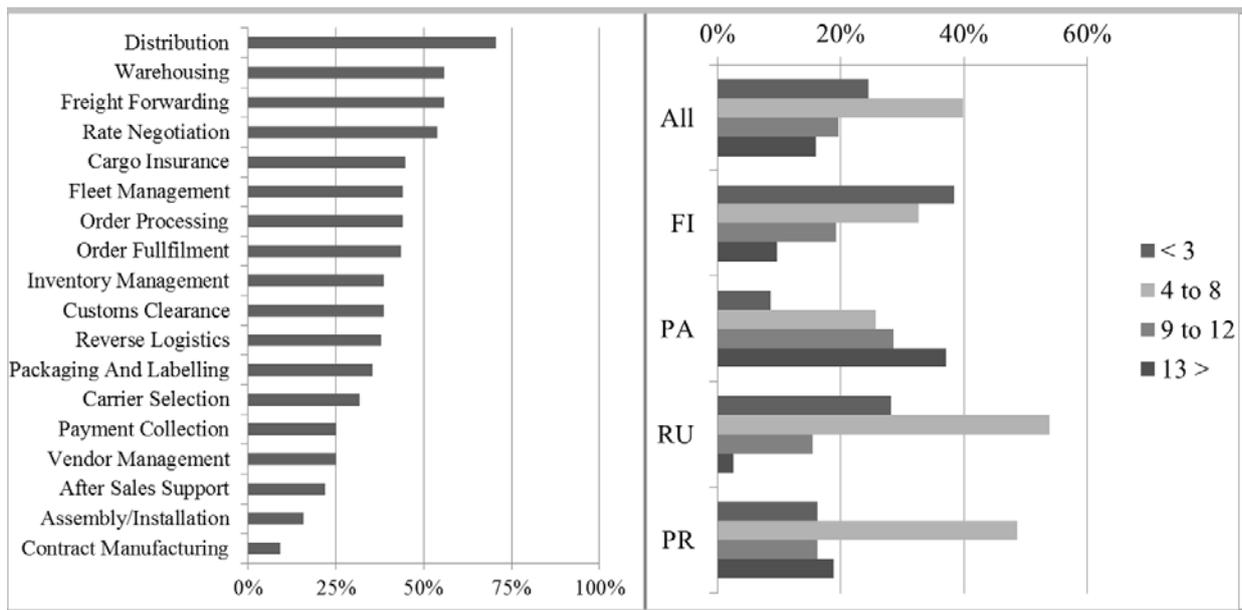
For all the participating companies, 24% perform 3 or fewer functions, while 16% are highly diversified organizations that perform 13 or more functions. The most common range is 4 to 8 functions at 40% of the respondents. When locations are considered, the tendencies are relatively similar except for Panama (see Figure 1, right), where the majority of the

organizations are highly diversified. This can be correlated to the fact that participants from Panama have a larger workforce, which allows for a higher diversity of functions, furthermore many LSPs in Panama are involved in activities associated to the Panama Canal and the free trade zones.

Table 2. Summary of respondent’s characteristics

		All (163)	FI (52)	PA (35)	RU (39)	PR (37)
Number of Employees	1-10	25%	21%	9%	23%	46%
	11-50	47%	67%	40%	40%	30%
	51-200	18%	12%	29%	17%	19%
	201-500	4%	0%	11%	3%	5%
	500+	6%	0%	11%	17%	0%
Functions performed	< 3	24%	38%	9%	28%	16%
	4 to 8	40%	33%	26%	54%	49%
	9 to 12	20%	19%	29%	15%	16%
	13 >	16%	10%	36%	3%	19%

Figure 1. Functions performed by the LSPs



4.2 Capabilities

Table 3 presents the mean and standard deviations for the all the items in the four capabilities areas. These items asked the respondents level of satisfaction with the organization’s capabilities and the scale used was: 1 = Completely dissatisfied; 2 = Mostly dissatisfied; 3 = Somewhat dissatisfied; 4 = neither satisfied or dissatisfied; 5 = Somewhat satisfied; 6 = Mostly satisfied; 7 = Completely satisfied. The last two columns of Table 3 indicate the

percentage of responses in the high end, *h%* (eg. response = 6 or 7), and the low end, *l%* (eg. response =1 or 2).

Table 3. Summary of respondent’s characteristics

Systems and Capabilities		mean	σ	<i>%h</i>	<i>%l</i>
O	Transportation management systems/processes	5.20	1.28	53%	11%
	Warehousing, inventory and distribution processes	4.72	1.75	45%	13%
	Value added operations	4.13	1.98	36%	25%
	Import and export processes	4.45	1.87	41%	20%
T	Customer interaction IT systems	4.60	1.63	39%	13%
	Purchasing/ Financial IT systems	4.82	1.48	43%	8%
	“Floor/road” operations IT systems	4.24	1.76	31%	22%
	Tracking/ expediting IT systems	4.55	1.61	35%	14%
	Management decision making IT systems	4.55	1.61	37%	13%
I	Development of new/customized logistic processes	4.53	1.49	31%	10%
	Problem-solving/new idea development	4.50	1.61	33%	12%
	Knowledge transfer and management systems	4.29	1.50	24%	14%

(O = operations, T = Information Technology, I = Innovation).

The general results indicate that LSPs are only slightly satisfied with their capabilities (only 2 out of 15 are above the 5 value of *somewhat satisfied*). LSPs seem to be most satisfied with their *transportation systems* and with the *transparency and information exchange level with their customers* capabilities (the two items averaged above 5). LSPs are least satisfied with their *value added operations* and *IT systems for “floor” operations*. The first is intuitive as these are not core LSPs operations. On the other hand, the low satisfaction level with *IT systems for “floor” operations* (eg. RFID, bar scanning, GPS), may reflect the ever-changing availability of new and more robust technologies, and in order to improve performance, managers may want the latest tech available (thus never satisfied!). It is relevant to note that there is a notable percentage of companies that are very satisfied with their capabilities in these two areas, *%h* = 36% for *value added operations* and *%h* = 31% for *IT systems for “floor” operations*.

4.3 Overall Performance

Table 5 presents the mean and standard deviations for the all the items in the three performance areas. The items asked the respondents to rate their company’s performance level when compared to the industry average and the scale used was: (1 = much worse, 2 =

worse, 3 = somewhat worse, 4 = average, 5 = somewhat better, 6 = better, 7 = much better). As in Table 2, the last two columns of Table 3 indicate the percentage of *high end* and *low end* responses. Out of the 12 items, 9 had a mean above 5 (somewhat better) and the other three were close to the average ranking, two of those being related to *Financial* performance. The results seem to indicate that from an operation standpoint the area of highest concern (and presents the most challenge) is the reduction of the delivery lead time. The results regarding the financial performance measures indicate that most LSPs are not satisfied with their bottom line results, or at least that there is significant room for improvement. In line with this result, it is interesting to note that the value of %*l* is very low for the *Operational* and *Innovation* measures, while is a relatively large value for the *Financial* measures (exception being Deliver lead time, an Operations measure).

Table 4. Summary of respondent’s characteristics

Performance		mean	σ	% <i>h</i>	% <i>l</i>
F	Gross profit margin	4.13	1.61	20%	17%
	Sales growth	4.19	1.54	20%	12%
O	Delivery lead-time	4.86	1.48	34%	7%
	On time delivery	5.60	1.00	55%	0%
	Customer satisfaction ratings	5.66	0.93	60%	0%
	Customer complaints	5.35	1.16	48%	1%
	Delivering goods in an undamaged state	5.85	0.97	74%	0%
	Increasing the value-added content of services	5.17	1.16	39%	1%
	Reduction of order cycle time	5.25	1.04	43%	0%
I	Providing new and better services	5.09	1.15	38%	0%
	Improvement to company’s operational systems	5.21	1.19	42%	2%
	Exploring best methods to achieve corporate goals	5.36	1.05	48%	1%
F = Financial, O = operations, I = Innovation					

4.4 Size, Focus, Capability and Performance

A goal of this preliminary analysis was to begin understanding possible relationships between the study’s variables. We first focus on the possible relation between characteristics of the LSPs and their capabilities and performance.

Figure 2 presents the average score for an aggregate measure of “all capabilities” (the mean for all capability items) and four performance measures, when compared to the number of employees and the number of functions per LSP. The four performance measures were

selected solely to demonstrate possible relations and not to describe relationships between the complete set of performance variables. As can be observed from Figure 2, the number of employees does not seem to have an effect on either the “all capabilities” measure or on the four measures of performance presented. On the other hand, the number of functions an organization performs seems to be positively correlated with the capabilities and the four measures presented, where there is a more notable effect on the two financial measures.

Figure 2. LSP characteristics, capabilities and performance results

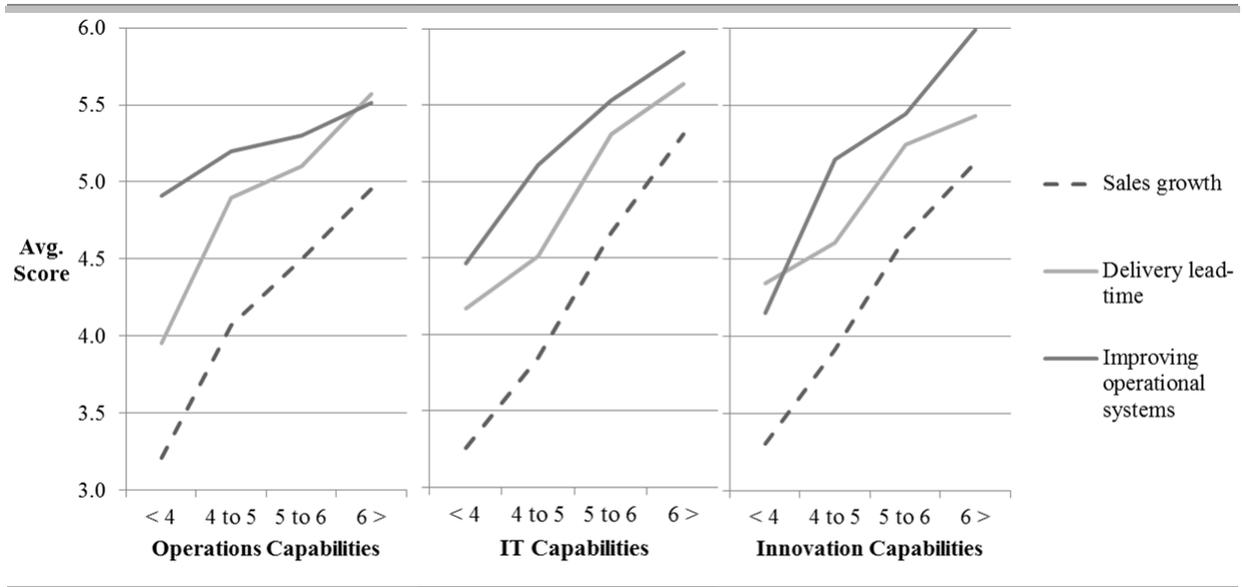


4.5 Types of capacities and performance

Figure 3 presents the relationship between the average score for three of the performance measures: sales growth, delivery lead-time, and improving operational systems, versus the aggregate score for three of the capability areas: operations, IT and innovation. These measures were selected to illustrate possible relationships and not to represent all measures of performance. The results demonstrate the positive relationship between capability and performance, and that these relationships have different degrees of relevance. For example, the results suggest that operational capabilities have a strong connection to sales growth, but not a considerable relationship to improving operational systems. On the other hands,

innovation capabilities are notably related to both sales growth and improving operational systems, but not as strongly to delivery lead time.

Figure 3. LSP characteristics, capabilities and performance results



5. MANAGERIAL IMPLICATIONS AND FUTURE WORK

This paper provides an initial picture of some of the results obtained in a multinational study of LSPs. The results point out to some interesting relationships, in particular the relationship between the diversification of the LSP and its capabilities and performance. It is sometimes argued that a focused/specialized company would have higher capabilities and performance, than one that offers many services and spreads out its resources. A more detailed analysis of the data is needed in this respect to better understand the relationship between focus and performance. A study that formally proposes the related hypotheses and perform statistical analysis including Factor Analysis and Structural modelling is ongoing.

There are several additional areas being currently analyzed as part of this multinational study. The data collected on the LSP included other types of capabilities, for example green/environmental capabilities, and as well other business factors as for example risk planning, information sharing, and long term relationships. In the near future the data

will be used to analyze the relationship between these factors and operational, innovation, and information technology capabilities.

REFERENCES

- Barney, J. D. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17, 99-120.
- 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.
- Cheng, Y. H., & Lee, F. (2010). Outsourcing reverse logistics of high-tech manufacturing firms by using a systematic decision-making approach: TFT-LCD sector in Taiwan. *Industrial Marketing Management*, 39(7), 1111-1119.
- Dyer, J. H., & Singh, H. (1998). The relational view, cooperative strategy and sources of interorganizational competitive advantage. *Academy of management review*, 23(4), 660-679.
- European Logistics Association / Arthur D. Little. (2007). *Innovation Excellence in Logistics: Value Creation by Innovation*, ISBN 978-3-924606-53-4.
- Lai, K. H., Wong, C. W., & Cheng, T. C. (2010). Bundling digitized logistics activities and its performance implications. *Industrial Marketing Management*, 39(2), 273-286.
- Liu, C.-L., & Lyons, A. C. (2011). An analysis of third-party logistics performance and service provision. *Transportation Research Part E: Logistics and Transportation Review*, 47(4), 547-570.
- Lu, C. S., & Yang, C. C. (2010). Logistics service capabilities and firm performance of international distribution center operators. *The service Industries Journal*, 30(2), 281-298.
- Malhotra, M. K., & Grover, V. (1998). An assessment of survey research on POM: from construct to theory. *Journal of operations management*, 16(4), 407-425.
- Prajogo, D., & Olhager, J. (2012). Supply chain integration and performance: The effects of long-term relationships, information technology and sharing, and logistics integration. *International Journal of Production Economics*, 135(1), 514-522.

- Priem, R. L., & Butler, J. E. (2001). Is the resource-based "view" a useful perspective for strategic management research? *Academy of Management Review*, 26, 22-40.
- Rumelt, R. P. (1984). Towards a strategic theory of the firm. *Competitive strategic management*, 26, 556-571.
- Rumelt, R. P. (1991). How much does industry matter? *Strategic Management Journal*, 12, 167-185.
- Sandberg, E., & Abrahamsson, M. (2011). Logistics capabilities for sustainable competitive advantage. *International Journal of Logistics: Research & Applications*, 14(1), 61-75.
- Selviaridis, K., & Spring, M. (2007). Third party logistics: a literature review and research agenda. *International Journal of Logistics Management*, 18(1), 125-150.
- Sharma, S., & Vredenburg, H. (1998). Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities. *Strategic Management Journal*, 19, 729-753.
- Stank, T. P., Keller, S. B., & Closs, D. J. (2001). Performance benefits of supply chain logistical integration. *Transportation Journal*, 41, 32-46.
- Wernerfelt, B. (1984). A resource based view of the firm. *Strategic Management Journal*, 5, 171-180.
- Yang, C. C., Marlow, P. B., & Lu, C. S. (2009). Assessing resources, logistics service capabilities, innovation capabilities and the performance of container shipping services in Taiwan. *International Journal of Production Economics*, 122(1), 4-20.
- Yeung, K., Zhou, H., Yeung, A. C., & Cheng, T. C. (2012). The impact of third-party logistics providers' capabilities on exporters' performance. *International Journal of Production Economics*, 135, 741-753.