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A novel technique for evaluating and selecting logistics service providers based on the logistics resource view

Saleh Fahed Alkhatib *, Robert Darlington [1], Zaili Yang [2], Trung Thanh Nguyen [3]

Liverpool Logistics Offshore and Marine Research Institute (LOOM), Liverpool John Moores University, Liverpool L3 3AF, UK

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ABSTRACT

The increasing importance of logistics outsourcing and availability of logistics services providers (LSPs) highlights the significance and complexity of the LSP evaluation and selection process. Most existing LSP evaluation and selection studies use historical performance data and assume independence among decision criteria. This paper proposes an integrated logistics outsourcing approach to evaluate and select LSPs based on their logistics resources and capabilities. This novel approach combines a fuzzy decision making trial, evaluation laboratory (FDEMATEL) and fuzzy techniques to order preferences by similarity to ideal solution (FTOPSIS) methods. The new multi-criteria decision making (MCDM) model addresses the impact relationships between decision criteria and ranks LSP alternatives against weighted resources and capabilities. The effectiveness of this approach is demonstrated through a real case study and a two-phase sensitivity analysis confirms its robustness.

1. Introduction

The growing demand for logistics outsourcing and the increase in the number and type of logistics services providers (LSPs) highlight the increasing importance of the LSP evaluation and selection process. Firms use different approaches to analyse, evaluate and select their LSP partners. The complexity of the decision and the large number of criteria involved increase the attractiveness of the Multi Criteria Decision Making (MCDM) approaches. LSP performance is a vital dimension in the evaluation process and many firms use LSPs' past performance records to select appropriate LSPs (Du, Guo, Huang, Li, & Guo, 2015; Lai, Ngai, & Cheng, 2002; Liu & Lyons, 2011; Moghaddam, 2015; Rezaei, Fahim, & Tavasszy, 2014; Straight, 1999). However, using past performance records alone is insufficient for performing a comprehensive evaluation. There is no guarantee that an LSP will replicate its past performance, particularly if the LSP will encounter unfamiliar work conditions. In many cases, the availability, accessibility and accuracy of performance measures should be investigated. Therefore, using LSPs' past performance as a single evaluation dimension is insufficient especially under high uncertainty decision-making environments. Many LSP evaluation and selection studies have failed to address the inherent uncertainty in data and the interdependencies among LSPs' evaluation and selection criteria – an area that has not been extensively studied. Moreover, the importance and complexity of the LSP evaluation and selection process increases in developing economies and emerging markets where the need for professional LSPs capable of supporting these economies in their development process is crucial. However, the lack of research about the developing logistics sectors increases the importance of this study. To overcome the aforementioned shortcomings, this study uses LSPs' logistics resources and capabilities to model the logistics outsourcing process and therefore, to evaluate and select the most appropriate LSP in developing economies. To the best of our knowledge, this is the first study to provide a fuzzy-based logistics outsourcing model that uses logistics resources and capabilities instead of performance metrics to evaluate and select LSPs under high uncertainty. This is the first study to analyse the logistics resources impact-relationship and therefore to identify independent resources among them. Again, to the best of our knowledge, this is the first study to analyse the logistics outsourcing decision based on the LSPs' resources and capabilities in the developing economies (Case of Jordan).

Firms' resources and capabilities and their effects on firm performance have been extensively studied using the Resource-Based View (RBV) theory. The RBV theory (Wernerfelt, 1984; Barney, 1991) states that firm performance and competitive

* Corresponding author. Tel.: +44 (0) 741 754 6959.
E-mail addresses: s.f.alkhatib@2013.ljmu.ac.uk, dr.saleh@yahoo.com (S.F. Alkhatib), R.I.Darlington@ljmu.ac.uk (R. Darlington), Z.Yang@ljmu.ac.uk (Z. Yang), t.t.nguyen@ljmu.ac.uk (T.T. Nguyen).
[1] Tel.: +44 (0) 151 231 2295.
[2] Tel.: +44 (0) 151 231 2531.
[3] Tel.: +44 (0) 151 231 2028.

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advantage are highly affected by firms' unique and valuable resources. Therefore, firms acquire various resources to generate the flexibility necessary to provide services that meet customer needs. A number of studies have identified the resources of various LSPs and their effects on firm performance (Hartmann & Grahl, 2011; Hunt, 2001; Lai, Li, Wang, & Zhao, 2008; Karia & Wong, 2013).

This study uses logistics resources to develop an advanced hybrid LSP evaluation and selection model. This model uses the decision making trial and evaluation laboratory (DEMATEL) method to evaluate and construct interdependency relationships between logistics resources and capabilities, identify independent resources and determine their weight. It also uses the technique for ordering preferences by similarity to ideal solution (TOPSIS) method to evaluate, rank and select an appropriate LSP. However, data uncertainty problems make it difficult for experts and Decision Makers (DMs) to provide crisp values to present different criteria weights and to quantify the precise rankings of LSPs. Therefore, the concept of fuzzy sets is integrated with the DEMATEL and TOPSIS methods to handle the uncertainty of the data. Fuzzy sets help DMs express their preferences using triangular fuzzy numbers (TFNs) through applications of specific linguistic expressions.

The remainder of this paper is organised as follows. Section 2 summarises the importance of logistics outsourcing and discusses the RBV and its relationship with LSP performance. Section 3 provides a logistics resource and performance literature review. Section 4 explains the hybrid model and illustrates the implementation procedures. Section 5 provides the results (resources weights, impact relationships and LSP rankings) and conducts a sensitivity analysis. Section 6 concludes the study.

2. Background

Logistics outsourcing has attracted the attention of firms, academics and researchers. Logistics outsourcing has proven to be an effective way to achieve a competitive advantage, improve customer services and reduce logistics costs (Aguezzoul, 2014; Boyson, Corsi, Dresner, & Rabinovich, 1999; Jonsson, 2008). Logistics outsourcing can reduce fixed costs and increase flexibility, allowing for a greater focus on a firm's core activities, a reduction of heavy asset investments and an improvement of service quality (Hsu, Wang, & Tzeng, 2012). At the same time, the decision to outsource includes a number of risks related to the loss of control, long-term commitment and the failures of some LSPs to perform their duties (Farahani, Rezapour, & Karadar, 2011; Soeanu et al., 2015; Wang, Ma, Lao, an Wang, & Y., 2014). Table 1 summarises some of the expected advantages and disadvantages of logistics outsourcing:

Table 1
Expected advantages and disadvantages of logistics outsourcing.

Expected advantages (benefits)	Expected disadvantages (problems)
Allows focus on core competences	Loss of control
Increase management capabilities	Poor worker quality
Save costs and time	Poor service levels
Reduce heavy assets investment	Misleading feedbacks
Increase flexibility and agility	Coordination problems
Increase efficiency	Environmental responsibilities
Value-added services and service variety	
Increase global inventory visibility	
Share responsibilities and reduce risks	
Economies of scale	
Share knowledge and experience	

2.1. Resource-Based View (RBV) and LSPs' performance

Resources and capabilities are among the strategic choices that firms use to achieve a competitive advantage. According to Mentzer, Min, and Bobbitt (2004), logistics resources can be divided into tangible and intangible resources. Lai et al. (2008) and Karia and Wong (2013) suggested using RBV theory to examine the impact of resources and capabilities on LSPs' performance. Based on the RBV theory, Karia and Wong (2013) developed a theoretical model of logistics resources and capabilities. They called it resource-based logistics (RBL). The RBL constructs logistics resources into tangible and intangible groups. The tangible resources group consists of technology and physical resources, while the intangible resources group consists of management expertise, relational and structure resources. According to RBL, these logistics resources and capabilities determine an LSP's performance. Therefore, logistics resources and capabilities are valid factors for evaluating and selecting the best LSP.

3. Literature review

A number of studies have identified the strategic resources of LSPs and their effects on LSP performance from various perspectives. During the 1990s, a limited number of studies investigated LSPs' resources and capabilities and analysed the relationship between LSPs' resources and capabilities as well as their performance (Chiu 1995; Kahn & Mentzer, 1998; Larson & Kulchitsky, 1999). Other studies, such as that of Novack and Wells (1992), investigated the strategic aspects of LSPs' resources and capabilities in terms of creating competitive advantage. Dramatic changes in the number and types of LSPs had occurred by the late 1990s, which in turn affected the number, nature and scope of logistics studies. The increasing demand for and number of LSPs augmented the number of studies of the logistics sector in general and of LSP evaluation and selection in particular.

Hunt (2001) analysed the effect of the availability of tangible and intangible resources on a firm's ability to produce efficiently and effectively, classifying resources into financial, physical, human, organisational, informational and relational resources. Lai et al. (2008) found that logistics resources and capabilities have a significant positive relationship to firm performance and affect LSPs' competitiveness. Hartmann and Grahl (2011) studied the flexibility of LSPs using RBV to measure the impact of this flexibility on customer loyalty. Karia and Wong (2013) used the RBV theory to develop the resource-based logistics (RBL) theory, which argues that logistics resources and capabilities are the determinants of LSP performance.

In addition to financial measures, a number of non-financial measures have been used to analyse the relationship between LSPs' resources and capabilities and a firm's performance. Ryoo and Kim (2015) analyse the impact of the knowledge complementarities on the supply chain performance. They use a two suppler and buyer samples to test the knowledge complementarities, inter-firm knowledge exchange and supply chain performance. Positive and significant relationships were found between knowledge exchange and supply chain performance. Ramanathan, Ramanathan, and Ko (2014) analyse the impact of the RFID usability features in the UK LSPs adoption of this technology. A positive influence of the RFID usability over the adoption level has been found. Meanwhile, Vlachos (2014) evaluates the impact of RFID practices on supply chain performance. He found that the implementation of RFID practices significantly affect the supply chain performance in different areas such as supplier, inventory, distribution, sales and forecasting. Knemeyer and Murphy (2006) focused on LSPs' relationships as the main logistics resources that