The Asian Journal of Shipping and Logistics 31(4) (2015) 459-468

Contents lists available at ScienceDirect

The Asian Journal of Shipping and Logistics

Journal homepage: www.elsevier.com/locate/ajsl

# Fuzzy MCDM Approach for Evaluating Intangible Resources Affecting Port Service Quality*

Ji Yeong PAK[a] , Vinh V. THAI[b], Gi Tae YEO[c]

[a] *Ph.D. Candidate, Incheon National University, Korea, E-mail:assambleuse@hanmail.net (First Author)*
[b] *Senior Lecturer, RMIT University, Australia, E-mail:vinh_thai_2000@yahoo.com*
[c] *Professor, Incheon National University, Korea, E-mail:ktyeo@incheon.ac.kr (Corresponding Author)*

ARTICLE INFO

*Article history:*
Received 17 July 2015
Received in revised form 30 November 2015
Accepted 1 December 2015

*Keywords:*
Port Service Quality
Intangible Resources
Port Choice
Resource-based View
Fuzzy TOPSIS

ABSTRACT

Intangible resources consist of soft resources such as knowledge, information and capabilities. It is important for ports to enhance intangible as well as tangible resources to obtain sustainable competitive advantage. In this connection, this study aims to identify port intangible resources which may contribute to the delivery of port service quality and to propose a fuzzy TOPSIS approach to solve the port choice problem focusing on intangible resources. Fuzzy TOPSIS is appropriate to assist decision making with ambiguous and uncertain problems such as port choice with respect to intangible resources. In this paper, five port intangible resources were identified and evaluated and five leading container ports in the Asia-Pacific region were assessed in terms of their intangible resources. A survey questionnaire was sent to 21 experts who are working in shipping companies in Korea and involved in the selection of ports. It was found that customer and relational resource contributes most to the delivery of port service quality while Hong Kong appeared to be the port where intangible resources were most highly evaluated. This research helps to enrich the literature on port service quality and port choice evaluation. Its findings can also be used as guidelines for port managers to prioritise resources that may have greater influence on the delivery of port service quality and the subsequent training and education programs.



## 1. Introduction

The trends of globalization and containerization have increased the competition among rival ports in recent years. Besides, port privatization and commercialization are also identified as the reasons which enhance port competition because private ports induce more competitive pressure

* This work was supported by the Incheon National University(International Cooperative) Research Grant in 2015.

http://dx.doi.org/10.1016/j.ajsl.2015.08.008

than public ports (Yuen et al., 2012). Moreover, ports are nowadays integrating more into supply chains than what they used to be as a part of the maritime transport chain (Magala and Sammons, 2008). In this respect, escalating competition has become an important momentum for ports to identify ways to enhance their competitiveness and keep them ahead of their competitors. In case of having similar characteristics and facilities, ports are required to differentiate themselves using their core strengths and advantages to be ahead in the competition. As port competition is increasingly intensified, it is crucial to identify the core factors derived from both tangible and intangible resources of ports which can help to secure their competitiveness.

Minimizing cost has always been a major consideration to most shippers and plays a main role in determining port choice. According to Magala and Sammons (2008), cost competition and service quality provided by the port were the two most important factors in port choice. Likewise, ports have focused on port price and service factors such as port location, facility, accessibility, shipment information, and port turnaround time (Murphy et al 1988, 1989, 1992; Ha 2003; Song and Yeo 2004). Although many studies have emphasized these factors, there remains the question of how these service factors may influence port competition. For example, reputation, knowledge of technology, efficient process, skilled personnel are intangible resources that can contribute to the strength of a port and its delivery of service quality. From the resource-based view (RBV), Wernerfelt (1984) identified brand names, capital, in-house knowledge of technology, efficient procedures, employment of skilled personnel, trade contacts, etc. as examples of resources which can be considered as the firm's resource strength. The above resources, also including skills, information and reputation, and relational asset, are classified as intangible resources (Knott 2009) and they represent capabilities or competences of a firm (Coates and McDermott 2002). The RBV explains the long-term sources of a firm's competitive advantage and sustainability. Barney (1991) argued that intangible resources help a firm to sustain its competitive advantages because these resources are heterogeneous and not completely mobile. Hence, it is not easy for competitors to imitate a firm's core capabilities (Hall 1992). This paper adopts the RBV to identify intangible resources which may influence the delivery of port service quality and thus port competition. Apart from identifying port intangible resources, this study also aims to evaluate their importance weights. Furthermore, leading Asia-Pacific competing ports were also examined to evaluate their service quality with regards to selected intangible resources. The evaluation of port intangible resources in relation to service quality is considered a multiple criteria decision making (MCDM) problem that includes diverse stakeholders. In addition, due to the abstractive nature of decision data and uncertainties in the real world when judging preferences and making decisions using multiple criteria, it is difficult to quantify the weights of the criteria and the rating of feasible alternatives (Mahdavi et al. 2009). Hence, we present a fuzzy TOPSIS approach (a technique for order preference similar to an ideal solution) for the purpose of this study. Fuzzy TOPSIS, using linguistic variables which reflect experts' judgements including preferences, helps to overcome the subjectivity of decision makers.

The rest of this paper is organised as follows. A review of literature on port service quality in relation to port competitiveness and intangible resources is presented in Section 2. Section 3 identifies the intangible resources influencing port service quality and ports for the examination, as well as the fuzzy TOPSIS research methodology. The empirical analysis applying fuzzy TOPSIS with regards to intangible resources and the targeted ports is performed in Section 4. Finally, the conclusion which includes academic and managerial implications are presented.

## 2. Literature Review

The domain of port service quality was initially studied in Foster's research (1978, 1979) whose importance was indicated by Ha (2003) since they highlighted different criteria depending on various groups of decision makers. Specifically, service quality and charges emerged as the most important factors to select a port in the second study of Foster (1979). Similarly, Willingale (1981) suggested some factors such as port pricing level, pricing practices, accessibility to ports, port facilities, and stability of port labour for the development of future port-routing pattern.

Ha (2003) compared and evaluated leading container ports using their service quality factors including information availability of port-related activities, port location, port turnaround time, facilities availability, port management, costs of port customer convenience from ship operators' and logistics managers' points of view. Especially, he suggested the importance of improving data availability and information flows. Ugboma et al. (2004) investigated the service quality of two Nigerian ports and highlighted not only customers' perceptions of the importance of key service quality factors but also their expectations of a swifter service and staff being more willingness to customers' needs.

Some studies have emphasised the importance of service quality as a strategy to enhance port competitiveness through customer satisfaction. A recent study revealed that there is a significant causal relationship between port service quality factors and customer satisfaction (Thai 2015), in which those factors relating to intangible resources of the port such as management, outcomes, process and image have more positive impact on customer satisfaction. Lu et al. (2011) mentioned that it is possible to improve the port capability by identifying the customer service needs of container terminals. To do that, they conducted an evaluation of customer satisfaction and the perceived importance of container terminals' service attributes. Chou (2010) identified the influential factors of carriers' port selections and addressed that they might be useful operation strategies and important port policies to enhance the ports' competitiveness and to attract potential containership' callings. Port charge, port operational efficiency, load/discharge efficiency and size and efficiency of container yard, hinterland economy and depth of berth were identified by Chou (2010) as important selection factors. Meanwhile, the possible attributes influencing port service quality were presented and optimal attributes were identified by the principal component analysis in the study of Kolanović (2008). Following the same theme, a comparative study (Cho et al. 2010) of the ports of Incheon and Shanghai was conducted to provide strategic implications for both ports with regard to service quality.

Studies to examine the factors affecting port competitiveness from various perspectives also exist. Tongzon (2009) mentioned that most studies examining factors of port selection are from the shippers' perspective and those from freight forwarders' perspective are relatively scant. He then evaluated key factors influencing port selection from the perspective of Southeast Asian freight forwarders. Meanwhile, different perspectives between truck liners and feeder service providers in port selection were studied by Chang et al. (2008) and this study considered six significant factors including terminal handling charges, local cargo volume, port location, berth availability, transhipment volume and feeder network. De Langen (2007) analysed port choice factors from shippers' and forwarders' views. His study showed similar views between shippers and forwarders in port selection but highlighted that the forwarders' demand for port service is more price elastic than that of shippers'. Similarly, Yuen et al. (2012) explored important factors to determine the competitiveness of container ports from the port user's perspective and eight factors were identified including port location, costs, port facility,