LOGISTICS RESEARCH NETWORK
ANNUAL CONFERENCE 2005

7th - 9th September 2005 Plymouth, UK

“International Logistics and Supply Chain Management”

Supported by:

Taylor & Francis
Taylor & Francis Group

Radical
GLOBAL SUPPLY CHAIN MCTDELL NC

Brittany Ferries

Published by:
Chartered Institute of Transport and Logistics
Logistics and Transport Centre
P.O Box 5787
Corby
Northants
NN17 4XQ
United Kingdom

Held at:
University of Plymouth, UK

Edited by:
John Dinwoodie
Jonathan Challacombe
Eugine Madejski
Dongping Song

SUPPLY CHAIN DYNAMICS AND TRANSPORT MANAGEMENT: A REVIEW
Andrew Potter, Chandra Lalwani

A SYSTEMATIC LITERATURE REVIEW OF DEMAND CHAIN MANAGEMENT – THEMATIC FINDINGS
Hong Qiao, Richard Wilding

THE EMERGENCE OF DEMAND CHAIN MANAGEMENT: AN INSIGHT FROM A SYSTEMATIC REVIEW OF LITERATURE
Hong Qiao, Richard Wilding

MANAGING VALUE AND WASTE IN SUPPLY CHAINS
Nick Rich, Peter Hines, Mark Francis.

THE DRY PORT CONCEPT – APPLICATIONS IN SWEDEN
Violeta Roso

THE CRITICALITY OF CONSUMABLE SPARE PARTS: AN INVENTORY SOLUTION
Christine E Rutherford, Robert E Woolford

DEVELOPMENT OF A LOGISTICS PROVIDER PERFORMANCE MEASUREMENT MODEL: AN APPLICATION IN THE ELECTRONICS INDUSTRY
Ömür Saatçıoğlu, Okan Tuna, Seren Özmehmet, Serdar Taşan

AGILE SUPPLY CHAIN MANAGEMENT OPERATIONS TACTICS: AN ARCHITECTURAL VIEWPOINT
Soroosh Saghiri, Robert H. Lawson

AN EMPIRICAL INVESTIGATION OF THE IMPACT OF FIRM SIZE ON SUPPLY CHAIN ENABLERS AND FIRM PERFORMANCE: THE CASE OF THE THAI GARMENT INDUSTRY
Mohammad A. Salam

THE REQUIREMENTS OF UK INDUSTRY FOR LOGISTICS EDUCATION
Mandip Sarana, Andrew Potter, Mohamed Naim

EVALUATING PHARMACEUTICAL SUPPLY CHAINS: IS A HOLISTIC APPROACH POSSIBLE?
Christopher J Savage, Claire McCann, Kevin J Roberts, Xue Z Wang, Jennifer Samanya

AN APPLICATION OF ANALYTIC HIERARCHY PROCESS (AHP) ON EAST MEDITERRANEAN PORT SELECTION: A PERSPECTIVE FOR TURKEY
Hande Sezerm, Soner Esmer, Okan Tuna, Kaan Yaralioglu
AN APPLICATION OF ANALYTIC HIERARCHY PROCESS (AHP) ON EAST MEDITERRANEAN PORT SELECTION: A PERSPECTIVE FOR TURKEY

Hande Sezer, Soner Esmer, Okan Tuna; Kaan Yaralioglu
1Dokuz Eylül University, School of Maritime Business & Management
2Dokuz Eylül University, Faculty of Economics & Administrative Sciences, Department of Econometrics

Abstract

A port is an integral platform, serving as a base for logistics, production, information transfer and international trade. It is also a springboard for the economic development of the hinterland. Currently, approximately 90% of the world’s trade is handled through seaports in terms of cargo volume. In other words, a port plays a significant role in transferring economic wealth to national as well as international economies. For liner companies, the East Mediterranean container trade market is a great opportunity owing to its distinguished location and huge market share. The East Mediterranean is the transit area between Asia-Northern Europe and Asia-North America, so it has great importance for all shipping companies.

In this study, cargo volume, port facilities, port location, and service level of East Mediterranean ports were evaluated by means of the Analytic Hierarchy Process (AHP) technique for port selection in launching a new route including Turkish and East Mediterranean ports. In other words, the main aim of this study is to provide an alternative proposal for liner operators in terms of exploring new routes and ports to enhance the East Mediterranean container market.

Keywords: Liner Development, East Mediterranean, Container Port, Analytic Hierarchy Process

Introduction

A modern port is no longer just a place where cargo has been loaded and discharged from ships. Today ports are a vital link in the logistics chain, which have to have skills in at least the three main modes of transport concerned: water, rail and road. Because shipping is scheduled traffic with a network of fixed ports, a liner shipping company is naturally interested in building up "permanent relations" with its ports. The liner shipping company's choice of regular port of call is based on a number of factors (Peng & Xueyue, 2003).

Today the role of the port becomes a key part in the logistics chain and hence faces new challenges. Modern ports must be competitive in terms of times and prices for their services. Seaports must be integrated within logistical chains to be able to carry out their functions. An efficient seaport requires infrastructure, superstructure, equipment, and adequate connections to other modes of transport, a well-motivated management, and qualified employees. Overall, the port selection will be market drive on a one-ship value-added basis. The ultimate decision of which ports to feature in the sailing programme is strategic and the shipping company will focus on its business plan's objectives (Peng & Xueyue, 2003).

Mediterranean Container Market

The Mediterranean container market has a crucial position within container trades with its trade volume affecting not only ports or liner carriers but also other parts of this delivery chain. In a competitive environment, port selection is the key factor influencing liner operators. In the liner service provider’s perspective, port choice factors have to be determined carefully in order to offer efficient and effective service to their customers.

Although the Mediterranean trade is one of the fastest growing container sectors worldwide, Turkish ports have not seen any major increases in cargo flows. One could argue that Turkish ports have certain levels of centrality but not sufficient enough to reach hub port status. Furthermore, the high deviation distances to Turkish ports from the traditional east-west arterial trade route through the Suez Canal does not help them either. Other issues exacerbating the problem include the low freight rates on the southbound routes between Northern Europe and Eastern Mediterranean resulting from the
economic and political problems in Turkey and Israel, two of the three key regional markets which have had a significant negative effect on the ocean carriers serving the Eastern Mediterranean ports in the recent past (Woodbridge, 2002).

This paper focuses on elements associated with port competitiveness from the perspective of cargo volume, port facilities, port location, and service level of East Mediterranean seaports and it is investigates empirically the competitiveness of container ports in East Mediterranean seaports using the framework of the Analytic Hierarchy Process, including elements and factors influencing competitiveness.

**Applying AHP to Port Selection**

The research adopted AHP to reveal the importance of port selection criteria. The AHP methodology is a Multiple Criteria Decision-Making (MCDM) technique that provides the relative importance of factors involved in decisions through pairwise comparisons of the same level independent criteria. The AHP technique has been applied to maritime transport and logistics studies in the past. Examples include Frankel (1992), who analyzed shipping policy decision-making and Shashikumar (2002), who considered liner shipping competition.

This research focuses on the decision-making behaviour of liner operators in Izmir (Turkey) and Israel container ports, which include Haifa Port, Ashdod Port, and Eilat Port. This route was selected because imports and exports between Turkey and Israel have been increasing continuously over the years.

In 2001, Turkey’s exports to Israel increased to 22% and reached 796 million US Dollars (USD) from 650 million USD in 2000, whilst the imports accounted for 524 million USD. In 2004 Turkey’s exports to Israel increased to 937 million USD and in the same way the import rate increased and accounted for 527 million USD. (http://ias.igeme.org.tr/plis/portal). Exports from the Port of Izmir to Israel amounted to 59 million USD in 2001, and in 2002, this rate increased to 70 million USD. Main commodities exported from Izmir to Israel are dried fruit, cereals and woodwork products.

A field survey was conducted among three international container ports in Israel. A questionnaire was presented to the liner operators by e-mail. In the first part, the respondents conducted pairwise comparisons of the importance of various port selection criteria. In the second part, they evaluated five criteria.

**Deriving AHP Criteria**

The starting point of this preparatory phase of the AHP survey used in this research was the identification of relevant criteria through a literature review. While there is limited literature on transhipment port choice, factors affecting port choice in general and factors affecting the general competitiveness of container ports are well documented in the literature.

Five most important criteria for the competitiveness of the port were identified as: cargo volume, port facilities, port location, service level and port traffic (Song & Yeo, 2004, p.40).

**Establishing Structural Hierarchies**

The starting point for the AHP analysis is to establish the hierarchy of associated decision-making choices in the form of a network structure (Song & Yeo, 2004). As a first step for the analysis, a set of problems under consideration is to be analysed and divided into a hierarchical structure (Song & Yeo, 2004). During this stage, the defining decision criteria are identified in the form of a hierarchy of objectives or general criteria. Typically, this entails having clearly defined primary goals. The evaluation criteria that influence each of the general criteria are placed at the next level of the hierarchy and the sub-criteria related to the second level are placed at the tertiary level (Shashikumar, 2003).
Developing Overall Weights or the Priorities for the Five Criteria in the Port Selection Problem

As the final step, evaluation values for elements of each level of the five individual criterion matrices were calculated using raw average data in the pairwise comparison matrix for the five criteria obtained in the second stage. According to AHP, the highest score indicated the preferred port.

<table>
<thead>
<tr>
<th></th>
<th>Haifa</th>
<th>Ashdod</th>
<th>Eilat</th>
<th>Row Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo volume</td>
<td>0.648619</td>
<td>0.294638</td>
<td>0.056743</td>
<td>0.250</td>
</tr>
<tr>
<td>Port Facilities</td>
<td>0.648619</td>
<td>0.294638</td>
<td>0.056743</td>
<td>0.128</td>
</tr>
<tr>
<td>Port Location</td>
<td>0.493881</td>
<td>0.444493</td>
<td>0.061626</td>
<td>0.071</td>
</tr>
<tr>
<td>Service Level</td>
<td>0.675211</td>
<td>0.262137</td>
<td>0.07265</td>
<td>0.040</td>
</tr>
<tr>
<td>Port Traffic</td>
<td>0.248248</td>
<td>0.700014</td>
<td>0.051738</td>
<td>0.510</td>
</tr>
<tr>
<td></td>
<td>0.434378</td>
<td>0.510444</td>
<td>0.055177</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Table 1: The Priority Matrix for the Port Selection Problem

Conclusion

When the weights of the criteria are considered as an average for all respondents, the results indicate that all five major criteria have different weight in influencing port selection behaviour. Port traffic volume with 0.510 weight and then cargo volume with 0.250 weight have higher values and more importance to other port selection criteria. Port location has less importance for the liner operators according to the results of the survey. Hence, it is not surprising that Ashdod port was selected as more preferable than Haifa in the AHP survey, as the export volume from the port of Izmir to Ashdod is significantly higher than that to the port of Haifa.

The set of data used for this research was limited as liner operators surveyed were from one country and this is acknowledged as a significant limitation. Also, the small sample surveyed included only liner operators and regional ones. This allowed the research to remain free from considerations regarding regional pressures, which could eventually affect port choice. In any case, the findings of the research are consistent with the perspective of the liner agency.

There is also scope for improving the methodology adopted in the future. Factor analysis could be used to provide an alternative approach for narrowing down the number of proposed criteria and a more objective method for distinguishing between criteria and sub-criteria. Furthermore, the fuzzy performance evaluation by semantic language was found to be difficult by most interviewees taking
part in this research and it required face-to-face explanations before the interviewees felt able to provide a score range for their related semantic evaluations. Finally, AHP can also provide the basis for required updates on the transhipment port selection problem. As no carrier operates in isolation, decision-making is bound to change following shifts in the environment in which carriers operate. A systematic update of the research would reveal evolving trends. If a broader regional study were to be carried out, the political risk factor, which has not been included to date in port selection literature, could eventually become a more influential attribute, although that would depend on the definition of the geographical range of the region considered.

References