

THE DETERMINATION OF KEY FACTORS FOR A FEASIBLE RO-RO SHORT SEA SHIPPING OPERATION

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Abstract:

The purpose of this paper is to determine the key factors for a feasible inter-state Ro-Ro Short Sea Shipping (SSS) that would be introduced in the Brunei, Indonesia, Malaysia and Philippines East ASEAN Growth Area (BIMP-EAGA). Although the literature has addressed a myriad of important factors through research conducted particularly in Europe and North America, the identification of the more significant determining factors for a feasible SSS operation is expected to assist SSS investors and authorities of the BIMP-EAGA countries to focus their resources on a few significant factors that could enable the introduction of a feasible SSS service in the sub-region.

Keywords: AHP, Delphi, Ro-Ro SSS, BIMP-EAGA, ASEAN, pair-wise comparison.

Introduction

Until today, there is no strict definition of short sea shipping (SSS) from the aspects of types of vessel used, distance travel or types of cargo or passenger transported. However, from the official definition adopted by the European Commission and the Maritime Administration (MARAD) of the United States (U.S), the focus of the SSS concept in both the European Union (E.U) and the U.S is for the movement of cargo whilst at the same time the services could be utilised for the efficient movement of passengers through coastal waters and inland waterways (EC, 1999; MARAD, 2014). Gleaning through the literature on SSS, it can be generally defined as “the movement of goods and people within internal and coastal waters that does not involve a transit through the ocean”. From the preceding definition, SSS services may involve all types of vessels such as feeder container vessels, tug and barge system, Roll-on Roll-off (Ro-Ro) vessels, passenger ferries, handy size bulk carriers and tankers as well as other suitable vessels. However, this paper attempt to only explore the feasibility of Ro-Ro SSS operation in Brunei, Indonesia, Malaysia and Philippines East ASEAN Growth Area (BIMP-EAGA) since earlier studies have identified Ro-Ro as the most suitable and efficient type of vessels for the transportation of cargo, passengers and vehicles simultaneously in a SSS operation (Kennedy, 2008; Medda and Trujillo, 2010; Sambracos and Maniati, 2012).

SSS that had started to decline since the 20th century due to the increased efficiency in road transportation and the introduction of airliners has now found a new role due to the rapid growth of road freight transportation over the last three decades. This uncontrolled growth has led to the increase of road transport inefficiency due to higher congestion, high construction and maintenance cost of road infrastructure, pollution, accidents and high operational cost. In light of the re-emergence on the popularity of SSS beginning early 1990s, many studies have been conducted on SSS as an alternative mode to road transportation particularly in Europe and North America. Among the notable studies are Baindur and Viegas (2011) that identify critical factors and barriers for establishing a successful European SSS project as well as Medda and Trujillo (2010) that identify the main determinants for SSS success in Europe. In North America, Yonge and Henesey (2005) examine the factors that are important in the development of SSS decision tool. Similarly, Perakis and Denisis (2008) and Kennedy (2008) attempt to identify the prospect of SSS in the U.S by highlighting the major inhibitions that must be overcome. In spite of the significant number of studies conducted in Europe and North America, similar studies on SSS in Southeast Asia in general and in the BIMP-EAGA sub-region in particular are very limited and difficult to trace through the open literature.

Aim

In light of the increase importance of SSS in many parts of the world and the effort by BIMP-EAGA countries to introduce inter-state Ro-Ro operation to enhance physical connectivity within the sub-region, this paper aims to identify the important determinants for a feasible inter-state Ro-Ro SSS operation from the perspective of its prospective stakeholders. This study is expected to contribute to the existing literature through the identification of the important factors that will contribute to a feasible inter-state Ro-Ro SSS operation particularly for BIMP-EAGA sub-region and their relative importance.

Literature Review

BIMP-EAGA

BIMP-EAGA was established in 1994 to address the economic and social development of the less developed and more remote area of the Association of Southeast Asian Nations (ASEAN) member states (except for Brunei Darussalam) with initial focus primarily through increased trade, investment and tourism, and ultimately through economic diversification beyond resource extraction. It is a sub-national growth area which is significantly less physically connected as it consists mainly of island economies and trade much more with the rest of the world, usually via capital ports, than within the sub-region. Due to the nature of its geography, Norojono and Lidasan (2005) describe the intermodal transport system of the BIMP-EAGA sub-region as being anchored more on maritime transport. From one's observation on the map of the sub-region, one could notice that the sub-regional intermodal transport system is primarily maritime-based and supported by a land-based transport system in the island of Borneo that links the EAGA provinces of Indonesia and Malaysia (Norjono & Lidasan, 2005). Geographically, the sub-region covers the entire sultanate of Brunei Darussalam; nine provinces in Kalimantan and Sulawesi, the island chain of Maluku and Papua (Indonesia); the federal states of Sabah and Sarawak and the federal territory of Labuan (Malaysia); and the entire province of Mindanao and the island province of Palawan (Philippines). These areas are among the poorest in their respective countries; but they are linked by a long history of trade and economic relations which has been going on for centuries with barter as a major form of trade until a few decades ago (BIMP-EAGA, 2012).

Asean ro-ro concept

In support of the establishment of an integrated, efficient and competitive maritime transport system, one of ASEAN key actions is to establish efficient and reliable shipping routes that include Ro-Ro vessels. The shipping routes would connect mainland and archipelagic Southeast Asia in support of BIMP-EAGA and other sub-regional initiatives (ASEAN, 2011). In support of the ASEAN Ro-Ro concept, the 5th BIMP EAGA Transport Ministers Meeting (TMM) welcomes the conduct of a study on BIMP-EAGA Ro-Ro network which may form part of an ASEAN Ro-Ro network (MPAC, 2011). The 2nd BIMP-EAGA TMM (2007) had given their commitment to intensify cooperation to realize the sea linkages priority projects connecting the ports of BIMP-EAGA member countries.

Important determinants for a feasible sss

Thus far, most of the contemporary research studies concerning SSS that could be traced centred on the SSS operations in Europe and North America. Among others, in order to embark on a successful SSS operation, Psaraftis and Schinas (2000) recommends further cooperation among various transportation modes, alliances among ports and the development of common system for freight transportation data. In evaluating the strengths and weaknesses of SSS in Europe, Paixao and Marlow (2001) reveal that the weaknesses are mostly due to the lack of efficient port operations, unreliable vessel schedules, excessive paperwork and high administrative cost. However, they espouse that SSS provides environmental benefits, lower energy consumption, economies of scale and lower costs required for infrastructure expansion (Paixao & Marlow, 2001). Similarly Medda and Trujillo (2010) in their analysis on the determinants of SSS argue that SSS is considered to be one of the most sustainable and economically competitive modes of transport due to its higher fuel economy and lower emissions of harmful pollutants. Their research is supported by Sambracos and Maniati (2012) that concludes that SSS produced considerably lower external cost with savings of 41.63%, 60.13% and 6.78% in the case of air pollution, CO₂ emission and natural/landscape destruction respectively.

In their study on the economics of SSS, Musso and Marchese (2002) argue that in order to determine the competitiveness of SSS, both the internal and external costs must be included. They also theorize that SSS competitiveness depends directly on sea-leg distances, which would be a very interesting factor to examine due to various lengths of the sea-legs identified in the BIMP-EAGA SSS study (Musso & Marchese, 2002). Similarly Medda and Trujillo (2010) argue that SSS is competitive for a certain types of distance, product and with certain types of ships. In their subsequent research, Paixao Casaca and Marlow (2005) examine the competitiveness of SSS compared to other transport modes and reveal that the quality of service provided by SSS service providers in Europe and the image of SSS relative to other modes of transport are still poor. In another study of SSS and European Motorways of the Sea (MoS) concept, Baindur and Viegas (2011) have identified the barriers to the success of SSS and grouped them into regulatory, technical, commercial and environmental. In the Baltic, Tananinem et al. (2012) in their interviews with SSS and logistics service providers along the Helsinki-Tallinn route conclude that the Ro-Ro and passenger (Ropax) concept is the only economically profitable solution along such route, without which higher prices of tickets would be detrimental to the effort to capture higher cargo and passenger traffics.

In North America, Yonge and Henesey (2005) through data obtained from their literature review, interviews and questionnaire survey develop a SSS decision tool specifically for a particular port in the United States through the weighting of various factors and their sub-factors using the scale between 1 (poor) to 5 (excellent). Through this weighting, they espouse that demand, geographic location, infrastructure capability and intermodal connectors are the four most important factors for Port Canaveral to operate a successful SSS operation (Yonge & Henesey, 2005). Perakis and Denisis (2008) in their examination of the prospects of SSS in the United States conclude that in spite of the wide acceptance of SSS among stakeholders, the obstacles to its successful implementation are additional handling costs, image problem, harbour maintenance tax and restriction imposed by the U.S. Cabotage laws or Jones Act. They also espouse two types of SSS i.e. the utilization of Load-on Load-off (Lo-Lo) vessels or container barges as a solution to terminal inefficiency problems and Ro-Ro ships as economical and reliable way for truck trailer transportation in the U.S. east and west coasts, Gulf of Mexico and the Great Lakes. This is due to the economies of scale and fuel efficiencies of Ro-Ro (Perakis & Denisis, 2008). Similar U.S. domestic inhibitions to the development of SSS involving the cabotage laws were also discussed by Kennedy (2008).

Denisis (2009) in his study on the prospect of SSS in the U.S. argues that the major obstacles for its success are port inefficiencies, lack of communication among shippers and shipowners, as well as legal and administrative constraints. In a study involving Ro-Ro vessel in the U.S., the National Ports and Waterways Institute discovers that the use of Ro-Ro vessels appears to be very competitive compared with the truck mode due to the high external costs of trucks in the U.S. east coast region (National Ports and Waterways Institute, 2000; Denisis, 2009). On the other hand, a study conducted by the U.S. Merchant Marine Academy on a proposed Ro-Ro vessel designed to carry 80 tractor-trailers reveals that Ro-Ro is cheaper than the truck's freight rate for distances longer than 200 miles if terminal and port fees are excluded (Lombardo, 2010).

In their study on SSS in Brazil, Medina et. al. (2011) theorize that the obstacles to a successful SSS operation are high cost of bunker fuel, delayed compensation for freight surcharge, problems in ship financing and high operating cost of Brazilian flagged vessels. In another part of the southern hemisphere, Everett and Kittle (2010) in their examination of the decline of SSS in Australia have identified lack of government policy, high operating cost due to cabotage restrictions and lack of integrated transport model as the reasons. Closer to BIMP-EAGA sub-region, a number of studies in the Philippines identify both the costs and inefficiency of cargo handling charges as a major factor in the high cost of domestic logistics inter-islands transportation and recommend the use of Ro-Ro shipping to replace the earlier Lo-Lo shipping (ADB, 2010). In ASEAN, a Ro-Ro SSS feasibility study was conducted on three routes namely Dumai-Malacca, Belawan-Penang-Phuket and Davao-General Santos-Bitung in 2012 (JICA, 2013). Due to the differing conditions of ports, routes and local demands, the study recommends the first two routes to embark on the Ro-Ro projects. As for the third route, it needs intensive demand finding and boosting measures to scarce existing traffic along the route (JICA, 2013). The survey data were processed using a financial analysis involving three important variables namely demand forecast, operation plan and ship procurement cost (JICA, 2013). In summary, the important determining factors gleaned through the literature are presented in Table 1

Authors Factors	Medda & Trujillo (2010)	Casaca & Marlow (2006)+ (2001)	Brooks & Frost (2006)	Grosso et al (2009)	Baindur & Viegas (2011)	Tapaninem et al (2012)	Perakis & Denisis (2008)	Chen & Lirn (2012)	Kruse et al (2004)	Musso & Mache-se (2002)	Lombar-do (2004)	Norojo -no & Lida-san (2005)
Promotion of SSS	✓	✓	✓	-	-	-	✓	✓	-	✓	✓	-
Regional agreements to relax shipping restriction	✓	-	✓	-	-	-	-	-	✓	✓	✓	✓
Coordinated administrative/CIQS formalities	✓	-	-	-	-	-	✓	-	-	✓	-	-
Good intermodal links	✓	✓	-	✓	-	-	✓	✓	✓	✓	✓	✓
Govt assistance at initial period/ start-up funding	-	-	✓	-	✓	-	-	-	-	-	-	-
Good port access	✓	✓	-	✓	-	-	✓	✓	✓	✓	✓	✓
Large payload or shipment volume	-	-	-	-	✓	✓	-	-	✓	✓	✓	-
Balance payload or shipment volume	-	-	-	-	✓	✓	-	-	✓	-	-	-
Weather & meteorological condition	-	-	-	-	✓	✓	-	-	-	-	-	-
Adequate port facilities & equipment	✓	✓	-	-	-	✓	-	-	-	✓	✓	✓
Suitable ship's type relative to payload, distance & speed	✓	-	-	-	-	✓	✓	-	✓	✓	-	-
Port efficiency	✓	✓	-	✓	-	✓	✓	-	✓	✓	✓	-
SSS service quality	-	✓	-	-	-	✓	✓	✓	✓	✓	-	-
Harmonization of admin procedure among ports	✓	✓	-	-	✓	-	-	-	-	-	-	✓

Table 1: Important factors for a feasible SSS Operation

Research methodology

The Analytic Hierarchy Process (AHP) is a type of Multi-Criteria Analysis instrument normally used for complicated and unstructured problem. The instrument that was developed by Saaty in 1980 is an approach that uses hierarchical model having levels of goal, criteria, sub-criteria and alternatives (Saaty, 2008). It has been described as an easy and useful methodology to enable a pair-wise comparison within the analyst area of expertise to be done (Oguztimur, 2011). AHP uses the concept of paired comparison and hierarchical structure or network analysis for the selection of the most appropriate alternative among a set of feasible alternatives (Saaty, 1997). The primary goal of an AHP is to select an alternative that best satisfies a given set of criteria out of a set of alternatives or to

determine the weight of the criteria in any application using the decision maker's or expert's experience or knowledge in a matrix of a pair-wise comparison of attributes (Saaty, 2008). In decision making, AHP emphasizes on the requirements to (1) identify the problem to be addressed; (2) the purpose or objective of the decision; (3) the criteria and sub-criteria to be analysed; (4) the stakeholders and groups that will be affected by the decision making; and (5) the alternative actions available (Saaty, 2008).

Key factors for the AHP survey

The first step in the research design involves identifying the main determining factors for a feasible SSS operation through the review of contemporary literature. The literature review has an extensive list that can be grouped into 14 factors as listed in Table 1. However, as not all the factors identified may be imperative for the success of interstate Ro-Ro SSS in BIMP-EAGA sub-region as in Europe or North America, a Delphi technique is adopted to allow stakeholders to determine the more important factors among the list of 14 and to identify other important factors that are not addressed by the literature but considered as imperative by the stakeholders for the success of SSS operation in BIMP-EAGA sub-region. The Delphi is a method that requires knowledgeable and expert contributors individually responding to questions and submitting the result direct to the coordinator who would process the answers looking for central tendencies and their rationales (Grisham, 2008). This technique was first developed by RAND corporation in the U.S in 1950s in order to assess variables that are intangibles or covered in an uncertainty by drawing on the knowledge and abilities of a diverse group of experts through a form of anonymous and iterative consultation (Grisham, 2008). Four key features that need to be adhered in the Delphi procedure are the anonymity of Delphi panels, iteration that allows panellists to refine their views, controlled feedback and statistical aggregation of group response that allows for quantitative analysis and interpretation of data (Rowe and Wright, 1999).

Due to the limited number of experts in maritime transport within the BIMP-EAGA sub-region, Delphi is found to be a more appropriate technique compared to other techniques such as factor analysis and brainstorming as there is no minimum limit of expert numbers stipulated for Delphi technique. A literature review performed by Skulmoski et al. (2007) found that a sample size of between 4 to 171 have been used in Delphi research. Similarly, a survey on successful PhD research between 1981 to 2006 discovered that the sample size used was between 8 to 345 panels (Skulmoski et al., 2007). On the hand, other techniques that are normally used to limit the number of factors are factor analysis and brain storming (da Cruz et al., 2013). Factor analysis requires a large sample, with a minimum of 200 respondents for a fair result whilst brain storming may not be possible due to the difficulty in assembling the expert respondents from four BIMP-EAGA countries together (MacCallum et al., 1999).

Initial result

From the initial feedbacks received from respondents in Round 1 Delphi questionnaire survey 13 out of 14 determining factors have been considered as Important (Likert Scale 5) or higher. Only "Regional agreements to relax shipping restriction" has been considered as moderately important. Five factors received close to Likert scale 6 (Very Important). Those factors are "Good intermodal links", "Balance payload or shipment volume", "Adequate port facilities and equipment", "Port efficiency" and "SSS service quality". On the other hand, a new factor i.e. "Security Perception" particularly in the waters of East Sabah and Southern Philippines has been considered as another important determining factor by two of the respondents. Adapting from the guideline given by Baidur and Viegas (2011) that classify the determining factors for SSS into four main groups, those factors can be included into an AHP model as in Figure 1. Once a consensus has been achieved on the important determining factors for a feasible Ro-Ro SSS operation in the next round of Delphi survey, the respondents will be subsequently requested to conduct pair-wise comparisons between all the factors (Saaty, 1994).



Figure 1: AHP Decision Making Model For Ro-Ro SSS

Conclusion

As a part of the less developed sub-region of ASEAN, the introduction of Ro-Ro SSS routes connecting the ports of the BIMP-EAGA member countries is a pre-requisite to the enhancement of physical connectivity within the sub-region. Learning from the failure of the first BIMP EAGA Ro-Ro SSS operation connecting Muara, Brunei to Menumbok, Malaysia, it is necessary that a systematic decision making model to enable for feasible SSS operations to be established within the BIMP-EAGA sub-region. Hence, it is hoped that this AHP decision making model for interstate Ro-Ro SSS will assist government decision makers and investors to identify the prospect of their SSS endeavours within the sub-region.

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