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Key Factor for Successful Roll-on Roll-off (Ro-Ro) Operation: a Delphi Technique at Langkawi Terminal, Kedah

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Abstract: ***Roll-on Roll-off (Ro-Ro) vessel been used as a sea transportation that designed to carry cargo as well with passenger from one place to another place. This research is conducted at Langkawi Islands. The main transportation systems of this island are more on sea transport rather than air transport. The dissatisfaction of passengers with the facilities provided by Ro-Ro's company at Langkawi Terminal has been discovered. Thus, this research are aims to investigate the key factors for successful Roll-on Roll-off (Ro-Ro) Short Sea Shipping (SSS) operations in Langkawi Terminal and to determine the relationship between key factors toward successful of Ro-Ro operation at Langkawi Terminal. Seven (7) competent expertise and experienced respondents in maritime sector at Langkawi terminal has been contributed in this research. A Delphi survey has been conducted for this research to identify any key factors and access their opinion on the relative of all key factors involved. Two (2) round of the Delphi questionnaire survey be used as a research instrument with the Likert scale. The reliability and validity of this research is 0.730. In conclusion, most respondents agreed that the key factors that have been analysis play an important role in achieving the successful of Ro-Ro operation at Langkawi Terminal.***

Keyword: Short Sea Shipping (SSS), Roll-on Roll-off (Ro-Ro), Facilities, Delphi, Facities.

I. INTRODUCTION

Langkawi is the island that separated from mainland Malaysia by strait of Malacca which a district of state of Kedah in northern Malaysia and located approximately 51 km from Kuala Kedah, 30 km from Kuala Perlis and 109 km from Penang. The total areas of this island are about 478.48 hectares including the surrounding islands. Langkawi Island mostly covered by forested mountains, hills and native plants. Langkawi Island only can be reached through sea and air. Langkawi Jetty connects the island with main destination such as Kuala Perlis, Kuala Kedah and Penang while Langkawi International Airport is connects the island to Kuala Lumpur, and Penang [12]. The location of Langkawi Island can be seen from figure 1.

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Fig. 1 Map of Langkawi Island [12]

II. BACKGROUND OF THE STUDY

Problem Statement

In brief, there are various issues relating to the quality of services by Ro-Ro shipping companies in tourist destinations in the state of Kedah, which includes Langkawi Island, where they have discovered that the dissatisfaction of tourists with the facilities provided such as poor maintenance, lack of facilities, tourist safety and comfort aspects [2]

Research Objective

This study aim to investigate the key factor for successful Roll-on Roll-off (Ro-Ro) Short Sea Operation at Langkawi Terminal, Kedah and to determine the relationship between key factors toward Roll-on Roll-off (Ro-Ro) operation at Langkawi Terminal, Kedah.

Significance of Study

The significance for this study is to academia and SSS investor and Local Authority. Firstly, the beneficial of the study will definitely help university students especially to future researcher who has the similar research as they can get additional information and can be a good reference to their research.

Furthermore, the result of the study will help them to improve their strategies and determine the benefits and utilize their limited resources to address the identified obstacles in ensuring the success of their SSS undertakings.

III. LITERATURE REVIEW

Definition of Short Sea Shipping

The clear definition of Short Sea Shipping (SSS) can be discovered neither within the academic literature nor a Common understanding among the professional maritime institution. The European Commission defines SSS as the carriage of goods by ships among the ports located within the geographical region of Europe or among these ports which are located in non-European countries with a coastline on the enclosed seas around Europe [22]. Besides, [21] as cited in [22] argued SSS can be considered as the transport of cargo for relatively short distances or to nearby coastal ports.

Besides, European Commission as cited in[22] claims SSS is a short-range maritime transportation that usually covers both national and international maritime transports along the coast and the islands, rivers and lakes. The definition of SSS can be defined as the movement of goods and people within internal and coastal waters that does not involve a transit through the ocean[5]. The same authors also states SSS services may involve all types of vessels for example, tug and barge system, Roll-on Roll-off (Ro-Ro) vessels, passenger ferries, handy size bulk carriers and tankers [5]. These statements are agreed by [9]states SSS is divided into transportation of bulk cargo that particularly for crude and refined petroleum products and general cargo such as Lift-on Lift-off (Lo-Lo) and Roll-on Roll-off (Ro-Ro).

Definition of Roll-On Roll-Off (Ro-Ro)

Roll-on Roll-off (Ro-Ro) can be defined as a ships that can transfer trailers, truck and wheeled cargo comprising passengers without the obligation of using a cargo handling gear [22]. Another author states Ro-Ro ships exclusive in providing continuous services of transporting vehicles, passengers, containers, and general cargoes on trucks [10] as cited in [22]. In brief, RO-RO ship can be defines as the water transportation that designed to carry cargo as well with passenger from one place to another place.

Key Factor for Successful Roll-On Roll-Off (Roro) Short Sea Shipping Operation

The key factor of successful RO-RO Short Sea Shipping Operation has been classified. [4] revealed that the factors contribute to the SSS service quality are the adequate port infrastructure, seamless intermodal link and regular frequency. In other article, [6]. discovered that adequate port facilities and equipment and government assistance at initial period and port efficiency are the key determinants to ensure the successful of Ro-Ro short sea operation. The same author in other article state the importance of transport is integration in an intermodal environment to ensure the reliability of delivery, capacity and high service frequency [5]. Furthermore, [4] claims the good port access which port accessibility by land and sea including port access by road and/or by rail, barge or the vessel itself and including the free accessibility of freight transport, private vehicles and public road transport to the Ro-Ro terminal. These statements are agreed by [5] propose good access which an availability of Ro-Ro terminals in close with other transport facilities would considerably increase the competitiveness of such terminals that lead to the successful. Another author states the location of the logistics parks that have been designed to be closed to ports, higher wages of truck drivers and shortage of truck drivers are the external factors that contributed to the successful of Japanese Ro-Ro services [8]. In addition, the key determinants of SSS are competitive for a certain types of distance, product and types of ships [4]. And [3].[19]as cited in [5] argued that, the economic viability of the SSS operation is dependent on the right mix of ship type, cargo to be carried and speed because as the speed increases, the fuel consumption grows exponentially where difference in port time may not be as relevant. Expounding further on the determinant suggested by involving the right mix of ship's type, cargo and space [7]. Besides, [16]as cited in [6]. in their analysis on the determinants of SSS argued 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. Moreover, [20]as cited in[5] also indicated the key determinant of SSS such as its environmental benefits, lower energy consumption, economies of scale and the lower costs needed for infrastructure expansion. Based on the several of SSS definition, identified the element in contemporary SSS discussions such as the inter-modality based on the efficient nodes and efficient ports and the environmental role of SSS within the chain of freight movement [4]. In addition, the key determinants of a successful SSS operation are port infrastructure and efficiency [22]. These factors are agreed by [7]and claims that government assistance at initial period and port efficiency are the key factors to ensure the successful of SSS operation. (Arof, 2015) state based on supply chain perspective, that (i) intensive promotion of SSS, (ii) growth of cargo volume, (iii) level of cooperation between parties active in port, (iv) efficient and effective multi-modal network, and (v) standardization of port infrastructure and port interfaces are the important determining factors for a successful SSS network in Europe. Other author indicated that there is a need for a different approach which may help increase the efficiency of a port call, for instance, longer opening hours, and more time and better tools for planning the sea voyage[13]. On the other hand, with regards to the efficient organization of operational processes, the field of partly mode-specific ICT (information and communication technologies) systems may have to be considered as another significant factor of SSS operation [22]. Besides, the large payload or shipment volume which sufficient amount of passengers, cargo and vehicles to be carried by a Ro-Ro SSS operation may contributes to the successful of SSS operation services [6]. In the same study, Promotion of SSS such as promotions effort of a reliable and efficient modern SSS services and their economics and environmental benefits are another key factor successful of SSS operation [6].

Delphi Technique

Delphi technique is a method that required knowledgeable and expert respondents individually responding to questions and submitting the result direct to the researcher who would process the answers looking for central tendencies and their rationales [6].

Besides, The same author has been described the Delphi technique as a method well-suited for

consensus-building through the use of a series of questionnaires delivered using a multiple iteration process to collect data from a panel of selected experts [6]. It is considered as a qualitative, long-range forecasting technique by some or a mixture of both qualitative and quantitative techniques by some others.

IV. METHODOLOGY

Research Area

Dermaga Tanjung Lembung (DTL) has been selected as a research area. DTL are located at Bukit Malut, Langkawi was built by Langkawi Development Authority (LADA) [14]. Figure 3.1 below shows the Dermaga Tanjung Lembung Layout. The facilities and services that provided in DTL are warehouse, Roll-on Roll-off service for vehicle handling irrespective of sea tidal, Crane and forklift equipment, fresh water supply for ship resupplying, office space for rental, mooring services, stevedoring, weighbridge, bunkering, warehouse and chiller/ freezer, wharf handling [15].

Fig. 2 Dermaga Tanjung Lembung layout [15]

Population and Sampling

This research will be conducted at Dermaga Tanjung Lembung, Langkawi. This research will be engaged and focused by finding information data in selected sample from the population at Dermaga Tanjung Lembung, Langkawi. The researcher utilized purposive sampling method.

For this research, only 7 experienced respondents are selected from the total population. Purposive sampling is a sampling technique in which researcher relies on his/her own judgment when choosing members of population to participate in the study. This technique is used to ensure the only respondents with adequate knowledge on the ferry operation will be surveyed to obtain their feedback.

Primary Data

A questionnaire is used as a primary research method to facilitate data collection during the field work. Questionnaire survey will be done to acquire the information directly from the respondents. These questionnaires are divided in two types of data which are qualitative and quantitative.

Secondary Data

The additional information from previous researchers will help to support the related data information that will assist to complete this research. Some of secondary data are from the literature review, journal and books or from website. Through secondary

V. FINDING AND DISCUSSION

The reliability analysis is to obtain from the commands analyse-scale reliability analysis. The test of validity of the data that researcher had been collected, Cronbach's Alpha methods had been used by the researcher. The Cronbach's Alpha test must be above 0.7 to identify that the data was valid to continue the research [12].

Table I states the result of the pilot test questionnaire survey that has been done by using Cronbach's Alpha. The reliability statistics of Cronbach's Alpha test for this data research is 0.73 which means these questionnaire are reliable to utilize.

Table. 1 Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.730	0.761	18

Demographic

Table II show the socio-demographic profile of the respondents. In this research, Round 1 and Round 2 questionnaires survey indicate the same seven (7) respondents that participated in the survey. The distribution of the percentage of male and female is approximately equal with 42.9% and 7.1% respectively. In terms of age, most respondents are between the ages of 20 to 24 years old and 25 to 29 years old which are equal with 42.9%. Most respondents are from ethics Malays which are the highest number of respondents with 85.7% and followed by ethics Chinese with 14.3%. 57.1% of respondents are from Ro-Ro company employee and 42.9% from Langkawi terminal employee. Lastly, the highest working experiences of the respondents are below two (2) years with 57.1% and followed by between 3 and 5 years (42.9%).

Table. 2 Respondents Demographic Profile

Information	Item	Total		Percentages (%)
1.Gender	Male	3		42.9%
	Female	4	7	57.1%
2.Age (years	20-24	3		42.9%
	25-29	3		42.9%
	30-34	1		14.3%
	35 and above	0	7	0%
3.Race	Malay	6		85.7%
	Chinese	1		14.3 %
	Indian	0	7	0%

4.Occupation	Langkawi Terminal employee Ro-Ro company employee Others	3 4 0	7	42.9% 57.1% 0%
5.Working experience (years)	0-2 3-5 6 and above	4 3 0	7	57.1% 42.9% 0%

Table. 3 Descriptive Statistics for Round 1

Descriptive Statistics			
	N	Mean	Std. Deviation
Adequate port facilities and equipment	7	4.00	0.816
Good intermodal link	7	4.29	1.254
Large shipment volume	7	3.57	0.535
Port efficiency	7	2.71	0.756
Port accessibility	7	3.14	0.900
Good service quality	7	3.71	0.756
Promotion effort	7	3.57	0.535
Government assistance at initial period	7	3.43	0.787
Valid N (Listwise)	7		

Table III above shows the descriptive statistics result for round 1 of the questionnaire. The highest mean value is good intermodal link which is 4.29 compare to the all independent that need in research. For the lowest mean value is port efficiency which is 2.71.This result shows that the respondent are really agree that good intermodal link is one factors that contributed to the successful Ro-Ro Short Sea Shipping at Langkawi Terminal. For the standard deviation, the highest value is good intermodal which is 1.254. The lowest value for standard deviation with value 0.535 is large shipment volume and promotions effort. If the standard deviation is small, the data are close to the mean value or average of data set and if the standard deviation is large, the data were distance from the mean value.

Table. 4 Descriptive Statistics for Round 2

Descriptive Statistics			
	N	Mean	Std. Deviation
Adequate port facilities and equipment	7	3.86	0.690
Good intermodal link	7	3.71	1.113
Large shipment volume	7	3.57	0.535
Port efficiency	7	3.00	0.816
Port accessibility	7	3.00	0.816
Good service quality	7	4.14	0.690
Promotion effort	7	3.71	0.756
Government assistance at initial period	7	4.14	0.690
World-class tourist area	7	4.00	0.577
Information Communication Technology	7	4.43	0.787
Fixed transportation for Malaysian NAVY	7	3.57	1.134
Valid N (Listwise)	7		

Table IV above shows the descriptive statistics for round 2 of the questionnaire. The highest mean value is Information Communication Technology which is 4.43 and the lowest mean value is port efficiency and port accessibility which is 3.00. The result shows that the respondents are strongly agree that Information Communication technology (ICT) is the key factors for the successful Ro-Ro Short Sea Shipping operation at Langkawi Terminal. Furthermore, for the standard deviation, the highest value with 1.134 is fixed transportation for Malaysian NAVY and the lowest value for standard deviation is large shipment volume which is 0.535. If the value of standard deviation is small, the data are close to the mean value or average of data set, besides that, if standard deviation is large, the data were distance from the mean value.

Normality Test

Normality test are different in the characteristics of the normal distribution that focus on skewness and kurtosis values which is the distribution function and the liner relationship existing between the distribution of the variable and the standard normal variable. The table of normality test is Kolmogorov- Smirnov that show the significant value or known as p-value. According to, if the p-value of the variable are below 0.05 the data are not normally distributed.

The Kolmogorov- Smirnov one sample test is a produce to examine the agreement between two set of value. For the purpose, the two sets of values compared are an observed frequency distribution based on a randomly collected sample and an empirical frequency distribution based on the sample's population. Table V and Table VI below show the resultS for both normality test round 1 and round 2.

Table. 5 Tests of Normality (Round 1)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Adequate port facilities and equipment	0.214	7	0.200*	0.858	7	0.144
good intermodal link	0.430	7	0.000	0.650	7	0.001
large shipment volume	0.360	7	0.007	0.664	7	0.001
Port efficiency	0.256	7	0.182	0.833	7	0.086
Port accessibility by land and sea	0.296	7	0.063	0.840	7	0.099
Good service quality	0.256	7	0.182	0.833	7	0.086
Promotions effort	0.360	7	0.007	0.664	7	0.001
Government assistance at initial period	0.421	7	0.000	0.646	7	0.001
Ro-Ro vessel at Langkawi Terminal can carry large and sufficient amount of shipment	0.264	7	0.149	0.887	7	0.262
Langkawi Terminal has a good port accessibility	0.435	7	0.000	0.600	7	0.000
Langkawi Terminal has a good port efficiency	0.258	7	0.174	0.818	7	0.062
Ro-Ro operation at Langkawi Terminal has a good service quality	0.338	7	0.015	0.769	7	0.020

Table. 6 Tests of Normality (Round 2)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Adequate port facilities and equipment	0.357	7	0.007	0.777	7	0.024
Good intermodal link	0.241	7	0.200	0.937	7	0.609
large shipment volume	0.214	7	0.200	0.858	7	0.144
Port efficiency	0.296	7	0.063	0.840	7	0.099
Port accessibility by land and sea	0.360	7	0.007	0.664	7	0.001
The good service quality	0.214	7	0.200	0.858	7	0.144
Promotions effort	0.256	7	0.182	0.833	7	0.086
Government assistance at initial period	0.214	7	0.200*	0.858	7	0.144
Langkawi Island as a World-class tourist area	0.296	7	0.063	0.840	7	0.099
Information Communication Technology (ICT) system in all Ro-Ro operation handling	0.296	7	.063	0.840	7	0.099
Ro-Ro vessel as a fixed transportation for TDLM Langkawi	0.264	7	0.149	0.887	7	0.262
Langkawi Terminal provides adequate port facilities and equipment.	0.435	7	0.000	0.600	7	0.000
Ro-Ro vessel at Langkawi Terminal can carry large and sufficient amount of shipment	0.345	7	0.012	0.732	7	0.008
that Langkawi Terminal has a good port accessibility	0.435	7	0.000	0.600	7	0.000
Langkawi Terminal has a good port efficiency	0.338	7	0.015	0.769	7	0.020
Ro-Ro operation at Langkawi Terminal has a good service quality	0.360	7	0.007	0.664	7	0.001
Langkawi Island as world-class tourist area will affect to the use of Ro-Ro service at Langkawi terminal	0.214	7	0.200*	0.858	7	0.144
Ro-Ro operations at Langkawi Terminal have an excellent of (ICT) system.	0.214	7	0.200*	0.858	7	0.144
Ro-Ro vessel has been used as a fixed transportation by TDLM Langkawi at Langkawi Terminal.	0.214	7	0.200*	0.858	7	0.144

Delphi Technique Analysis

Round 1 questionnaire has been divided into quantitative and qualitative parts. The qualitative parts, in the questionnaire where the respondents are asked for identified another factor that contributed to the successful Ro-Ro operation and the relationship between the factors toward Ro-Ro operation at Langkawi Terminal.

The quantitative part in the questionnaire, eight (8) factors of the successful Ro-Ro SSS operation that identified through the literature review was rated by the respondents using a five-point Likert scale. The five-point Likert scale which the 1 represents 'Strongly disagree' and 5 represents for 'Strongly agree'. All the eight (8) factors that identified through literature review have been defined briefly in round 1. The eight (8) factors given are as follows:

Factor 1 (F1): Adequate port facilities and equipment.
Factor 2 (F2): Good intermodal link
Factor 3 (F3): Large payload and shipment volume
Factor 4 (F4): Port efficiency
Factor 5 (F5): Port accessibility
Factor 6 (F6): SSS Service quality
Factor 7 (F7): Promotion of SSS

Factor 8 (F8): Government assistance at initial period.

All the 7 respondents that provided their feedback have given their grades on all the eight factors. All the factors involve has been rated and based on TableVII below shows the lowest mean with of 2.7 for factor of port efficiency (F4) and the good intermodal link (F2) has highest mean with of 4.29.The second highest mean are adequate port facilities and equipment (F1) with mean of 4.00 followed by port accessibility (F5) with mean of 3.86. Mean with of 3.71 are SSS service quality (F6) while with mean of 3.57 for large payload and shipment (F3) and promotion of SSS (F7). Government assistance at initial period (F8) and port accessibility (F4) has mean of 3.43 and 3.14 respectively.

Table. 7 Rating for 8 factors for successful Ro-Ro SSS operation

Respondent	F1	F2	F3	F4	F5	F6	F7	F8
1	4	5	4	3	3	3	4	5
2	3	5	3	3	4	4	3	3
3	3	2	3	2	4	3	4	3
4	5	5	4	4	5	5	4	4
5	4	3	4	2	4	4	3	3
6	4	5	3	2	4	3	4	3
7	5	5	4	3	3	4	3	3
Mean	4.00	4.29	3.57	2.71	3.86	3.71	3.57	3.43

Furthermore, Section B Part B of questionnaire requested the respondents to determine the relationship between key factors toward Ro-Ro operation at Langkawi. The five (5) questions are listed as below:

Question 1 (Q1): Langkawi Terminal provide adequate port facilities and equipment
Question 2 (Q2): Ro-Ro vessel at Langkawi Terminal can carry large and sufficient amount of shipment
Question 3 (Q3): Langkawi Terminal has a good port accessibility.
Question 4 (Q4): Langkawi Terminal has a good port efficiency
Question 5 (Q5): Langkawi terminal has a good service quality.

Table VIII below indicated the rating that has been rated by respondents. The highest mean are Question 1(Q1) with a mean of 4.00 and the lowest mean with a mean of 3.14 by Question 4(Q4). Lastly, Question 2(Q2) with a mean of 3.57 and Question 3(Q3) and Question 5(Q5) with a mean of 3.71 and 3.43 respectively.

Table. 8 Rating for the relationship between key factors toward Ro-Ro operation at Langkawi

Respondent	Q1	Q2	Q3	Q4	Q5
1	4	3	4	4	4
2	4	5	4	3	4
3	4	3	4	3	4
4	4	5	4	4	4
5	4	2	4	2	4
6	4	4	3	4	2
7	4	3	3	2	3
mean	4	3.57	3.71	3.14	3.43

After conducting the qualitative analysis, three new key factors have been concluded that were not part in eight (8) key factors that have been listed through the literature review process and three new relationships between key factors toward Ro-Ro SSS operation at Langkawi Terminal has been listed. The three factors are perceived as other key factors that must be considered in determining the key factors from successful Ro-Ro SSS operation at Langkawi Terminal. The three factors are 'Information Communication Technology (ICT) system', 'Langkawi Island as a world-class tourist area' and 'fixed transportation for Tentera Laut Diraja Malaysia (TLDM) Langkawi'. Langkawi Terminal have an excellent of Information Communication Technology (ICT) system', 'Langkawi Terminal as a fixed transportation for TLDM Langkawi', are the another three additional for the relationship between key factors toward Ro-Ro SSS operation at Langkawi Terminal. The definitions given are as follows:

Section B Part A:
Factor 9 (F9): Langkawi Islands as a world-class tourist area.
Factor 10 (F10): Information Communication Technology (ICT).
Factor 11 (F11): Fixed transportation for TLDM Langkawi. Fixed transportation in loading and discharging vehicle from the TLDM agency.

Section B Part B:
Question 6 (Q6): Langkawi Island as a world-class tourist area will effect to the use of Ro-Ro services at Langkawi Terminal

Question 7 (Q7): Langkawi Terminal have an excellent of Information Communication Technology (ICT) system
Question 8 (Q8): Langkawi Terminal as a fixed transportation for TLDM Langkawi'

In round 2 Delphi surveys, all the question that rated in round 1 Delphi survey with the three additional analyses are identified in the same survey through questionnaire. The round 2 questionnaire have been forwarded to same respondents for further judgement. In this round, the questionnaires are distributed to the respondents by e-mail. The respondents are requested to re-evaluate the factor on a five-point Likert scale that similar to round 1 Delphi survey.

Table. 9 Comparison between Delphi Round 1 and Round 2

	Round 1		Round 2	
	Factor	Mean	Factor	Mean
First	F2	4.29	F10	4.14
Second	F1	4.00	F1	4.00
Third	F5	3.86	F3	4.00
Fourth	F6	3.71	F6	4.00
Fifth	F3	3.57	F8	4.00
Sixth	F7	3.57	F4	3.86

In comparing the result from the two rounds of Delphi survey, it can be conclude based on the table XI. Based on Table XI, shows the comparison between Delphi Round 1 and Round result which has been rated by respondents. Adequate port facilities and equipment (Factor 1) has been Retained in top three positions in two rounds among the key factors for successful Ro-Ro SSS operation at Langkawi Terminal. Although large shipment volume (Factor 3) did not retain its earlier position in top three in Round 1, it has been retained in Round 2 of Delphi survey while SSS service quality (Factor 6) has been retained in top six of the key factors for two rounds. For the results, adequate port facilities and equipment, large shipment volume and SSS service quality are the important key factors for the successful Ro-Ro Short Sea Shipping operation at Langkawi Terminal.

VI. CONCLUSION

The objective of this research is to investigate the key factors for successful Roll-on Roll-off (Ro-Ro) Short Sea Shipping operation at Langkawi Terminal. The seven (7) expertise or respondents that have been contributed for both rounds of Delphi survey at Langkawi Terminal mostly agreed and approved that Adequate port facilities and equipment, Large shipment volume, SSS service quality, Good intermodal link, Port efficiency, Port accessibility, Promotions effort, Government assistance at initial period, Langkawi Island as a World-class tourist area, Information Communication technology (ICT) and Fixed transportation. Notwithstanding, the other area and the other sub factors that contribute to the successful of Ro-Ro operations at Langkawi Port are not elaborated yet. This is suggested that the other scholar will consider the potential area and the other sub factor that contributed to the successful of Ro-Ro operation.

REFERENCES

1. A. Mustakim, C.K.M. Faizul, M.farismawardi, M.Hanafi, Syafiq, M.Zulkarnain & M.Zulhusnie. (n.d). Port Competition in Malaysia. Universiti Technology Malaysia.
2. Abdullah, Shardy & Abdul Razak, Arman & Marzuki, Azizan & Jaafar, Mastara. Assessing tourist satisfaction with the facilities provided at Langkawi Island gateway jetty terminals. Liburna. (2017).
3. Arof A.Md & Nair R. Key Factors For A Feasible Ro-Ro Short Sea Shipping Operation In Bimp- Edga Sub Region. Aminuddin Md Arof, Rawindaran Nair. 1st International Maritime Conference. (2014).
4. Arof A.Md & Nair R. The identification of key success factors for interstate Ro-Ro short sea. International Journal of Shipping and Transport Logistics, (2017). 262.
5. Arof A.Md, R.MD Hanafiah R.Md & Ooi I. A Delphi Study on the Potential Benefits and Obstacles of Interstate Short Sea Shipping in Archipelagic Southeast Asia. International Journal of e-Navigation and Maritime Economy, (2016). 97.
6. Arof, A. M. RO-RO SHIPPING AND LEAN PORT OPERATIONS IN SUPPORT OF ASEAN PHYSICAL CONNECTIVITY. (2016). Conferent paper.
7. Arof. Determinants for a Feasible Short Sea Shipping: Lessons from Europe for ASEAN. Asian Social Science, (2015). 228.
8. Baindur, D., & Viegas, J. M. Success factors for developing viable motorways of the sea projects in Europe. Logistics Research, 4(3-4), (2012), 137-145.
9. Đelović, D. CORRELATION BETWEEN THE SHORT SEA SHIPPING CAPABILITY (POTENTIAL) OF A PORT AND PORT MACHINERY FLEXIBILITY. International Journal for Traffic and Transport Engineering, 5(3). (2015).
10. Furuichi, M., Kumazawa, K., & Shishido, T. ASEAN-wide Connectivity by realizing RO/RO Shipping Network-Challenges and Opportunities. (2015).
11. Green, R. A. The Delphi Technique in Educational Research. Sage Open, 4(2), (2014). 2158244014529773.
12. Hoekstra, R., J. Vugteveen, M. J. Warrens, and P. M. Kruyen. "An empirical analysis of alleged misunderstandings of coefficient alpha." International Journal of Social Research Methodology 22, no. 4 (2019): 351-364.
13. Johnson H. & Styhre L. Increased Energy Efficiency in Short Sea Shipping Through Decreased Time in Port. Transportation Research Part A: Policy and Practice, (2015).71.
14. khalid.N, Ang.M & Elvia . Assessing the issues, Challenges and Prospects of selected secondary Ports in Penisular Malaysia. Maritime Institute of Malaysia (MIMA). (2011).
15. Langkawi Port. Retrieved from Our Services: (April, 2019).https://www.langkawi.com.my/
16. Medda, F., & Trujillo, L. Short-sea shipping: an analysis of its determinants. Maritime Policy & Management, 37(3), (2010), 285-303.
17. NJ.Gogtay & UM.Thatte. Principles of Correlation Analysis. Statistics for Researchers, (2017). 78-81.
18. Omar, Shida Irwana & Ghapar Othman, Abdul & Mohamed, Badaruddin. . Omar, Shida Irwana & Ghapar Othman, Abdul & Mohamed, Badaruddin. The tourism life cycle: An overview of Langkawi Island, Malaysia. International Journal of Culture. (2014).
19. Paixão Casaca, A. C., & Marlow, P. B. Logistics strategies for short sea shipping operating as part of multimodal transport chains. Maritime Policy & Management, 36(1), (2009). 1-19.
20. Paixao, A.C., Marlow, P.B.,. A review of the European Union shipping policy.Maritime Policy and Management 28 (2), (2001).187–198.
21. Yonge, M., & Henesey, L. A decision tool for identifying the prospects and opportunities for short sea shipping. A study commissioned to the Canaveral Port Authority. (2005).
22. Zakaria A & Arof A.Md. Determinants for a Successful Interstate Ro-Ro Operations in Indonesia-Malaysia-Thailand: A Review. Int. J Sup. Chain. Mgt, 67. (2018)

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