DEVELOPING A CONCEPTUAL MODEL FOR A SPICE EXPORT COMPANY TO SELECT A FREIGHT FORWARDER IN SRI LANKA

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Abstract- The study deals with the factors affecting the freight forwarder selection process, to study the interactions between them and thus empirically assess which factors are most influencing in logistics operations that must be given a careful attention. For studying the interaction between the factors and prioritizing the factors, have used ISM (Interpretive Structural Modeling) technique, by which the weights for the performance factors are examined and ranked. A conceptual model is developed via the results of the ISM method. AHP (Analytical Hierarchy Process) was used to rank the freight forwarders and found out the best freight forwarder from a group of freight forwarders. This method is applied to spice industry. Qualification and final selection of the freight forwarder are done based on the method proposed. Data have collected from the mentioned industry and the results are implemented by the industry.

Index terms- Freight Forwarders, Interpretive Structural Modeling (Ism), Analytic Hierarchy Process (Ahp), Main Criteria, Sub Criteria, Priority Weight.

I. INTRODUCTION

Globalization has emerged as a major force shaping business strategies during the last two decades, which has led to an increase in trade for many developing countries [2].The recent development in international businesses has increased the importance of logistics as it is a strategic tool to achieve the competitive advantage. Even the firms who are exporting or doing business in a few foreign countries have to face substantial logistical problems due to the market expansion with geographic conditions and time constraints.

In order to avoid the inconvenience in international trade and as a solution to reduce the complexity, companies develop relationships with third parties who are specialized in international freight forwarding. International Federation of Freight Forwarders Association (FIATA) defines freight forwarders as "A company which provides services of freight forwarding on behalf of a customer. These include transport, regrouping, storage, management, packaging and the distribution of cargos as well an auxiliary and advisory services regarding Issuing and managing documents, customs facilitations, declaring cargos to the authorities, the insurance of merchandise, collecting and paying freights". Companies need to select the best freight forwarders in order to get the best service with the least cost. "Efficient logistics management is considered a powerful source of competitive differentiation since it is not only a source of cost savings, butthe logistics can also enhance the quality of product or service offerings by the firm"[1].

The research focuses on developing a model for a company to select a freight forwarder to fruition of their international trade functions. The topic had to be further narrowed down for the convenience and accuracy of data collection. Thus the spice industry is selected for the data gathering and model development. Model evaluation had conducted in a reputed company in the spice export trade of Sri Lanka.

II. METHODOLOGY

A. Model development Process

The performance criteria which were relevant from the shipper's point of view were identified by taking opinions from the industry experts and literature reviewed [4]. Table 1 shows the factors which were finalized for the study.

Next a questionnaire was developed to pair wise compare the selected criteria. A matrix was used for the comparison of criteria (Sample in fig: 1). As the model focuses on the spice trade, experts related to spice field were used for the data gathering. The following are considered to be the field of expertise selected,

- Spice trading companies - 6 responses
- Freight forwarders - 2 responses
- Export development board - 1 response
- Ministry of Agriculture - 1 response

Obtaining the highest number of responses from sectors which has the highest influence is the accepted method [3]. Therefore to be fairer in the sample collection opinion of spice trading companies were prioritized by obtaining 60% response from them while other areas considered were less prioritized.
Reference numbers where the criteria are identified as the major ones are included along with the sub criteria.

Table 1: Performance criteria

Main criteria	Sub criteria	Total No.of References
Cost	1. Low rate [1],[4]	9
	2. Credit facility [4]	7
Reliability	3. Meeting deadlines [7],[8],[9]	6
	4. Information reliability [7]	8
	5. Control over the delivery time [8]	5
Customer service factors	6. Fast response to custom inquiries [4],[7]	7
	7. Track and trace service [4]	5
	8. Schedule flexibility[7]	4
	9. Performing unanticipated deliveries [7]	7
	10. Customer profile confidentiality [4]	6
Company backgrou nd	11.Supportive staff [10],[8]	8
	12.Industry expertise [9]	6
	13.Dealing with reputed mainlines [10]	5
	14.Legal compliance [9]	5

Following is a sample matrix used to compare the criteria. Accordingly all the 14 criteria were separately compared with each other. 10 responses were gathered from the above mentioned 4 areas to obtain the final reachability matrix.

J / I	Cost	Reliability	Customer service	Company background
Cost				
Reliability				
Customer service				
Company background				

Fig.1. Sample matrix

Initially Criteria were evaluated through a self-interaction matrix. The direction of the contextual relationship among elements was identified using a scale as follows.

V-The factor "I" will affect factor "J" majorly
A- The factor "J" will affect factor "I" majorly
X- Factor "I" and "J" will help to achieve each other
O- Factor "I" and "J" are unrelated.

Next the Final reachability matrix (Fig.2) had been obtained by incorporating the following rules.

If the relation Ci to Cj= V then element Cij=1 and Cji=0
If the relation Ci to Cj= A then element Cij=0 and Cji=1
If the relation Ci to Cj= X then element Cij=1 and Cij=1
If the relation Ci to Cj= O then element Cij=0 and Cji=0

J / I	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Driving power
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
3	0	0	1	1	0	0	0	0	0	0	0	O	0	0	2
4	0	0	0	1	1	1	1	0	1	O	1	O	O	1	7
5	0	0	1	1	1	1	1	0	1	0	1	0	0	0	7
6	0	0	0	1	1	1	1	0	0	0	1	0	1	1	7
7	0	0	1	1	1	1	1	0	0	0	0	0	0	0	5
8	0	0	0	0	0	0	0	1	1	0	0	0	1	1	4
9	0	0	1	0	1	0	0	1	1	0	1	0	1	1	7
10	0	0	0	0	0	0	0	0	0	1	1	1	0	0	3
11	0	1	1	1	1	1	1	0	0	1	1	0	0	0	8
12	0	0	0	0	0	0	0	0	0	1	0	1	1	1	4
13	1	1	1	0	1	1	1	0	0	0	1	1	1	1	10
14	0	0	1	1	1	1	0	0	1	0	0	1	1	1	8
Dependence power	2	3	7	7	8	7	6	2	5	3	7	4	6	7	74

Fig.2. Final Reachability Matrix

The final reachability matrix was obtained along with the driver power and the dependent power. Driving power and dependence power are calculated by adding the number of ones in the rows and columns of each Criterion respectively. These driving power and dependence help to classify the criteria into four clusters as shown in fig.3.

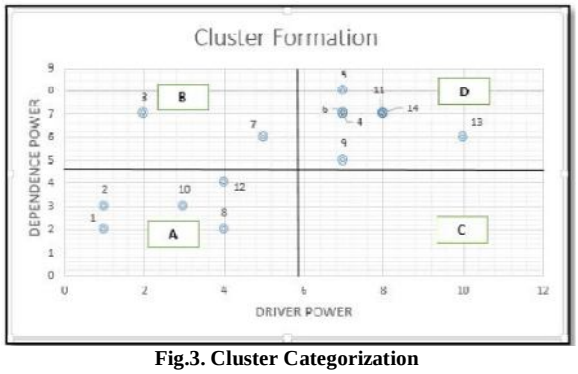


Fig.3. Cluster Categorization

A: Autonomous criteria - The First cluster consists of Autonomous criteria which possess weak driver power and weak dependence. They have few links with the other factors, but those may be strong.

B: Dependent criteria - Second cluster consists of the criteria with strong dependent power and weak driver power.

C: Independent criteria - Have strong driving power, but possess weak dependence.

D: Linkage criteria -These variables are unstable where any changes with these have effect on others while influencing on it.

Criteria levels were identified by incorporating the rules of the ISM process(table 2). Variables in a lower level cannot influence on the higher level variables. Having the basis as the levels of the criteria, priority weight relevant to each sub criteria were identified (Table 3) and relevant weights were summed up to obtain the weights of the main criteria. Number of levels obtained in the ISM process for criteria accounts to be 8. So the maximum rating of the criteria in the reachability matrix, eg-1 is divided by 8 (Sub criteria) to obtain the lowest value of the lower level. The multiples of this value are used to assign weights to higher levels.

The basic Numerical model had been developed as shown below. Only the main criteria, priority weights were depicted in the model, so that a broader view can be taken rather than narrowing down to each sub criterion.

C1- Cost, W1-0.037

C2- Reliability, W2-0.022

C3-Customer Service, W3-0.389

C4- Company Background, W4-0.351

$\sum_{i=1,j=1}^{n} \mathbf{C_i W_j}$, n=4 (1)

Table 2: Level Partition

Sub criteria	Level								
Low rate	1	■							
Credit facility	1	■							
Meeting deadlines	5	■	■	■	■	■			
Information reliability	4	■	■	■	■				
Control over delivery time	3	■	■	■					
Fast response to customer inquiries	2	■	■						
Track and trace service	3	■	■	■					
Schedule flexibility	6	■	■	■	■	■	■		
Performing unaticipated deleiveries	8	■	■	■	■	■	■	■	■
Customer profil confidentiality	2	■	■						
Supportive staff	6	■	■	■	■	■	■		
Industry expertise	7	■	■	■	■	■	■	■	
Dealing with reputed mainlines	4	■	■	■	■				
Legal compliance	2	■	■						

Table 3: Priority weights

Sub criteria	Weights (w_i)	Normalized Weights (Nw_i)
Low rate	0.125	0.0185
Credit facility	0.125	0.0185
Fast response to custom inquiries	0.25	0.0370
Customer profile confidentiality	0.25	0.0370
Legal compliance	0.25	0.0370
Control over delivery time	0.375	0.0556
Track and trace service	0.375	0.0556
Dealing with reputed mainlines	0.5	0.0741
Information reliability	0.5	0.0741
Meeting deadlines	0.625	0.0926
Schedule flexibility	0.75	0.1111
Supportive staff	0.75	0.1111
Industry expertise	0.875	0.1296
Performing unaticipated deleiveries	1	0.1481
∑wi	6.75	

Conceptual model developed is shown in fig: 4. There the levels of each criteria and priority weights were combined to approach the model. The cluster categories which convey the drive and the dependence power of each sub criterion were used to differentiate the connectivity between each factor.

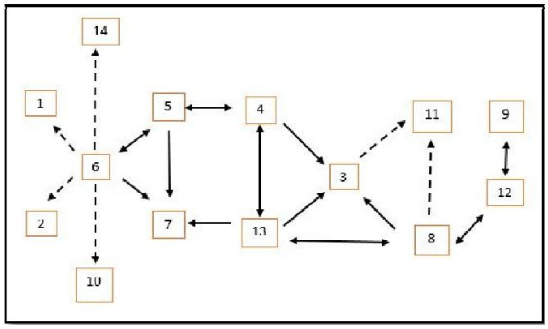


Fig.4. Conceptual model developed

Fig: 5 shows the legend of the arrow heads used in the model configuration. As the level position is considered in model development the below mentioned interconnections were only required for the task. Legend of the model developed is depicted in the figure follows.

Arrow type	Descrition
1 ◄► 2	Both 1 and 2 has a high drving power and dependence power. 1 and 2 both effect to each others performance
1 ► 2	1 has a high driving power and it direclty effect the 2's performance
1 --► 2	2 posses less driver power and dependenc power. 1 drives 2.

Fig.5. Legend – ISM based model

B. Model evaluation process

Best freight forwarder selection is the final step of the study. Accordingly a company is selected and they were provided with questionnaires to evaluate each freight forwarders contribution to the considered criteria. For these the freight forwarders that they currently used in the international trade are taken into consideration. Weights hold by each freight forwarder for each sub criteria was obtained from the Analytical Hierarchy Process and to obtain the optimum scores, weights derived from the interpretive structural modeling technique were multiplied by the relevant freight forwarders criterion weight and added to obtain the total. . Summary of the freight forwarder scores is shown in fig. 5 below.

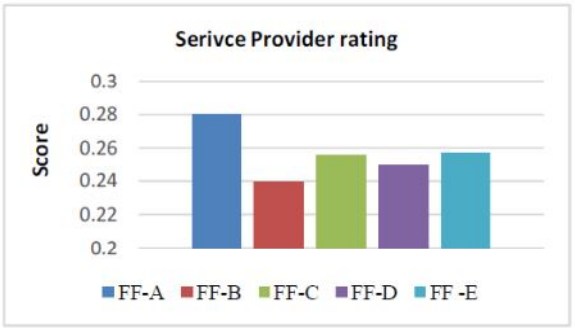


Fig.6. Summary of service provider ratings

Accordingly FF-A is the best freight forwarder matching to the selected company requirement. Selected company should consider on FF-A in order to fulfill their international trade activities.

CONCLUSION

In the current scenario of global operating conditions and competitive environment, it has become highly necessary for companies to run logistics operations efficiently. There any inaccurate selection of a service provider can lead to numerous problems which affect the company's overall performance. This shows that freight forwarder selection process is highly essential concern for companies.

Model to select a freight forwarder focusing on the spice trade was completed through ISM method. Developing and sustaining the service provider selection is one of the biggest challenges in the competitive market. The model developed through the study basically conveys that customer service and the company background are the major ones. Ultimately the service provider evaluation model conveys a considerable value to decision makers. Model evaluation is successfully completed through AHP analysis on data collected regarding five freight forwarders. This was carried out by selecting a specific company engaging in the spice trade and their main service providers were evaluated and ultimately the best freight forwarder is recommended for the selected company. Accordingly FF-A is the best freight forwarder matching to their need. The considered company should select FF-A in order to fulfill their international trade activities. FF-C and FF-E holds approximately same ratings.

RECOMMENDATIONS

Future researchers should focus on larger samples which will improve the validity of the findings and will allow the results to be generalized over a larger population.

The latent variables used in this research can be further broken down in order to provide a more focused output for the readers and thereby to improve the usefulness of the research findings. As this research is only focused on the spice industry, future researchers can extend the scope of this research to different organizational segments in order to compare the behavior differences in each of them

It can be recommended to the service providers that as the research confirms the exporters' considerable attention towards the service factors rather than the pricing factor is necessary, they should focus more and more on the development of their service attributes compared to the cost attributes.

Basically, they should try on fulfilling the mismatch of objectives that exist between them and the exporter. Currently in Sri Lankan context the focus of freight forwarders regarding marketing their service holds a less intensity. Therefore, it would be advisable for them to use more innovative marketing tactics and communication tools like social networks, sponsoring events in advertising their service rather than using the same traditional practices.

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