

# The Key Factors in Shipping Company's Port Selection for Providing Their Supplies

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**Abstract**—The aim of this research is to identify the key factors in shipping company's port selection in order to providing their requirement. To identify and rank factors that play the main role in selecting port for providing the ship requirement, at the first step, data were collected via Semi-structured interviews, the aim was to generate knowledge on how shipping company select the port and suppliers for providing their needs. 37 port selection factors were chosen from the previous researches and field interviews and have been categorized into two groups of port's factor and the factors of services of suppliers companies. The current study adopts a questionnaire survey to the main shipping companies' operators in Iran. Their responses reveal that level of services of supplying companies and customs rules play the important role in selecting the ports. Our findings could affect decisions made by port authorities to consider that supporting the private sections for ship chandelling business could have the best result in attracting ships.

**Keywords**—Port selection, ship supplier, ship chandler, provision.

## I. INTRODUCTION

Each business, organization or factory requires different materials for its operation. An important area of operational decision making in each business is purchasing. One major aspect of the purchasing function is supplier selection, the acquisition of required material, services and equipment for all type of business enterprises.

Supplier selection is the process of determining the suitable suppliers who are able to provide the buyer with the right quality products and/or services at the right price, at the right time and in the right quantities [1].

It has a direct and indirect impact on the performance of an organization [2]. Quality of products or services, safety, job satisfaction and performance can be affected by suppliers.

As the organization becomes more and more dependent on their suppliers, the direct and indirect consequences of poor decision making will become more critical.

In practice there could be several criteria used by a firm for its supplier selection decision, such as price offered, part quality, on-time delivery, after-sales services, response to order change, supplier location and supplier's financial status [3].

In shipping company this process is more complicated. Ships needed to be supplied with enough food, beverages and other requirements for the ship's maintenance and repair.

If the ship not be supplied by provision and her requirements in loading or discharging port she has to deviate,

at this moment the shipping company faces two range of factors; that related to the port selection and supplier selection.

As we know ship sail to ports for different purpose such as loading and discharging her cargo, repair, and crew change or obtain requirements (medical care, fuel, provisions).

Ports face the constant risk of losing clients, not because of deficiencies in port infrastructure or terminal operations, but because the client has new and different requirements.

To maintain its market position, and increase profits a port should respond to the various requirements of shipping companies. Ports need to systematically monitor that they are efficient and effective in serving the interests of their users and make an effort to understand the factors affecting shipping companies' port choice.

Iranian port's geostrategic position allows them to playing important role in Persian Gulf, In spite of that, Iranian ports are not successful in attraction of ships in order to obtain their requirement. Even Iranian ships deviate from their main route (*strait of Hormoz*) to foreign ports located in Persian Gulf such as Khorfakkan and Fujairah in purpose of getting their requirement; Iranian port lose ship supplying market due to this deviations. The reasons why one port is chosen whereas another is not are usually studied by asking port users about their preferences. Nowadays port authorities try to attract shipping companies by different offers supplies such as spare part, bunkering and repair, provision and medical care. Under recent competitive port market environments, Ports need to consistently control that they are efficient and effective in serving the interests of their users and must become more familiar with their customers' needs [4].

Against this backdrop, the contribution of this paper is determining the factors affecting shipping companies' port choice in order to obtain their requirement and supplier selection.

The next section describes the literature related to port and supplier selection, followed by sections on methodology and analysis. The final section is conclusion.

## II. LITERATURE REVIEW

Since we face two rang of factors, the port and supplier selection factors; studies on these two fields were reviewed.

### A. Studies on Port Selection

There is numerous literature which attempts to determine Port selection factors, but Port selection factors varies among its users.

Reference [5] investigated a series of port selection criteria from the perspectives of different users such as ports, carrier

and freight forwarder. Their empirical study indicates that port selection attributes are evaluated differently by various participants. Their study also indicated, equipment availability, shipment information, large volume Shipments and handling charge were most important factors. But Reference [6] argues that the traditional criteria such as port equipment appear to have relatively little influence on the port selection process.

From the perspective of shipping companies there are many factors for selecting a port by the aim of loading and discharging cargo such as cargo source [7], port facilities [8], [9], operating cost [10], [11], service quality [12]. There are some scholars who pay attention to port selection factor for bunkering. Reference [13] argues that fuel cost, port charge and geographical location are the important factors to choose a port in order to bunkering, but Reference [14] finds that fuel quality play critical role in this process. Over viewing the literature, it seems that most studies have focused on the concerns of shippers and freight forwarders rather than carriers; and also In the previous studies, factors influencing the selection of ports are typically by the aim of loading and unloading the cargo not obtaining the provisions or such requirement.

#### B. Studies on Supplier Selection

Supplier selection studies have dated back to as early as 1960s. Reference [15] for the first time carried out priority determination of 23 different commonly used criteria for the supplier selection problem. He found that the quality, delivery capability and performance history of suppliers are the most important and geographical location is the less important.

The 23 criteria presented by Dikson still cover the majority of criteria presented in literature until today. Indeed the evaluation of industrial environment modified the degrees of the relative importance of these criteria and also introducing new criteria as we see other scholars [16] advanced their work and incorporated electronic transaction capabilities as another key criterion consisting of electronic catalogue management, electronic order management, electronic financial management and supplier e-skills into the supplier selection framework.

Reference [17] based on reviewing 74 papers; observe that Price, delivery, quality, production capacity and location are the criteria most often treated in literatures. Although the importance of these criteria are different based on the organization or factory objectives and strategies but as in [18] argued that price, quality and on time delivery are the most important in every organization with different size or objectives.

Reference [19] suggested that criteria such as Management capability, production capacity and flexibility, design and technological capability, financial stability, experience and geographical location, address integration capabilities of viable suppliers.

Reference [19] investigated in the field of ship building suppliers and found that price, quality and geographical location are important in this industry.

The literature review unveiled a lack of studies on port selection by aim of obtaining requirement and also studies on ship supplier selection. Thus, this paper contributes find out factors affecting port selection for obtaining requirement and then ship supplier selection factors.

### III. RESEARCH METHODOLOGY

The main methodology of this paper is to survey a sample of shipping companies and analyze the survey results by exploratory factor analysis to categorize factors and Friedman test to rank them.

#### A. Questionnaire Design

Date collection instrument of this research is a questionnaire; a draft questionnaire instrument was designed by critically referring to the various port and supplier choice factors adopted in the previous studies and via Semi-structured interviews. Questionnaire was pre-tested by sending to 10 shipping companies in Iran to check whether the form was easy for the respondents to understand and also if any important factor were missing or not. From the pre-test, three indices; relationship with union, Promptness of issue document in port and communication systems of supplier, were recommended to be added to the questionnaire.

Therefore, the questionnaire was modified to add the missing factors. The final questionnaire composing of 37 port selection factors (17 port selection factor and 20 supplier selection factor as shown in Tables I and II) included general information about shipping company personnel who make decision on port choice, before asking the factors. The main forms of response adopted in this study are closed format using five point Likert scales technique; where '1' means the lowest importance while '5' represent the highest priority.

Indeed Without reliability, the researcher cannot be assured to results of empirical studies. Internal consistency between items and Cronbach's alpha coefficient that is based on, is more popular method for testing the reliability of the instrument [21] so reliability test, based on Cronbach's alpha, was used to test the internal consistency of questionnaire. Given that Cronbach's alpha a values exceeding 0.7 indicate high consistency [22], computed results indicate (0.88) normal internal consistency.

#### B. Data Collection

As we know the buying unit is made of those organizational members who are involved in the buying decision process. Some members are Influencers and some of them are Deciders.

Influencers help to set the technical specifications and help in evaluating alternative offerings. Deciders make the purchasing decisions. Deciders have formal authority and responsibility for deciding among alternative suppliers.

So that just certain personnel of shipping companies (such as captain, chief officer on board of ship and commercial and technical departments) are involved in decision making in order to choice the port and suppliers to get ship requirements, The questionnaire distributed between these personnel of 12

Iranian shipping companies. Chain sampling (snow- ball sampling) was used for distributing the questionnaire. 131 useable questionnaires were received.

TABLE I  
PORT SELECTION FACTORS

1. Nearness to loading port (origin)
2. Nearness to unloading port (destination)
3. Water depth in approach channel and at berth
4. Port tariff
5. Ports safety
6. Port operation policy
7. Port facilities
8. Relationship with union
9. Political stability
10. Service speed
11. Port congestion
12. Variety of supplier companies in port
13. Custom services
14. Ability to obtain whole special requirement (provision, bunker, repair etc.)
15. 24 h a day, seven day a week services
16. Promptness of issue document
17. Dominate weather condition of port

TABLE II  
SHIP SUPPLIER SELECTION FACTORS

1. Meet Packaging requirement
2. Freshness and attention to expiry date of products
3. Service speed
4. Speed in issue invoice
5. Variety of products
6. Accuracy of invoices
7. After sale support
8. Delivery reliability
9. Response flexibility
10. Price
11. Discounts
12. Level of e_ commerce (communication systems)
13. Professional labor
14. Technical expertise
15. Extra free services
16. Impressive advertisement
17. Accuracy in filling order (quality)
18. Accuracy in filling order (quantity)
19. Ability to provide requirement at anchorage
20. Safe loading of products to ship

TABLE III  
JOB POSITION OF RESPONDENTS

captain	53%
Chief officer	17%
Commercial department personnel	19%
technical department personnel	11%
Sum	100%

TABLE IV  
WORK EXPERIENCE OF RESPONDENTS

1-5	15%
6-10	17%
11-15	48%
16-20	13%
>20	7%
Sum	100%

#### IV. ANALYSIS AND RESULTS

In order to interpret the survey results more clearly, we tried to reduce the variables via exploratory factor analyses and rank by Friedman test.

##### A. Descriptive Analysis

The characteristics of respondents were analyzed by identifying their work experience in the shipping industry. Tables III and IV present the characteristics of respondents.

##### B. Factor Analysis Results

To categorize the various variables into several meaningful factors, exploratory factor analyses were adopted. Factor analyses are performed by examining the pattern of correlations (or covariance) between the variables. Variables that are highly correlated (either positively or negatively) are likely influenced by the same factors, while those that are relatively uncorrelated are likely influenced by different factors.

Although 37 variables were specified in the questionnaire, it is shown that the dimensionality can be reduced into a smaller number of factors (principal components). Grouping the variables into the factors should totally depend upon the value of loadings. To aid interpretation, only variables with factor loadings greater than 0.5, were extracted.

As shown in Tables V and VI; the 17 item of port selection have been categorized into 5 key factors and 20 item of supplier selection have been categorized into 7 factors through an exploratory factor analysis.

Notably, four variables 'Port congestion'; 'Relationship with union'; 'Variety of supplier companies in port' and '24 h a day, seven day a week services' were deleted since their factor loadings were less than 0.5.<sup>1</sup>

TABLE V  
LOADINGS ON EACH FACTOR (PORT FACTOR)

Factor	Variable	1	2	3	4	5
Geographical location	Nearness to loading port	0.94				
	Nearness to unloading port	0.95				
	Dominate weather condition of port	0.64				
Advanced port management	Service speed		0.7			
	Ability to obtain whole special requirement		0.6			
	Port operation policy		0.3			
	Promptness of issue document		0.3			
Outer environmental condition	Port safety		-0.3			
	Custom services		0.6			
	Political stability			0.8		
Port charges infrastructure conditions	Port tariff				-0.52	
	Port facilities					0.2
	port depth					0.68

Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.56.

<sup>1</sup> Loadings 0.50 or greater are considered practically significant. Loadings exceeding 0.70 are considered indicative of a well-defined structure, which is the goal of any factor analysis.

TABLE VI  
LOADINGS ON EACH FACTOR (SUPPLIER FACTOR)

F	V	1	2	3	4	5	6	7
Quality of products	Packaging requirement	0.8						
	Freshness and attention to expiry date of products	0.7						
	Accuracy in filling orders (quality)	0.1						
Proficiency	Technical expertise		0.3					
	Professional labor		0.6					
Velocity	Ability to provide requirement at anchorage		0.7					
	Service speed			0.58				
Quality of services	Speed in issue invoice			0.47				
	Accuracy of invoices				0.62			
	Level of e-commerce (communication systems)				0.3			
	Accuracy in filling orders (quantity)				0.21			
Charges	Delivery reliability				0.6			
	Safe loading to the ship				0.79			
Variety of services	price					0.3		
	Discounts					0.7		
Marketing policy	Response flexibility						0.26	
	Variety of products						0.6	
Marketing policy	Extra free services							0.79
	After sale support							0.48
	Impressive advertisement							0.19

Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.64

### C. Friedman Test Results

To check how importantly each variable was graded by the respondents, the Friedman Test was used.

The Friedman Test is the non-parametric alternative to the one-way ANOVA with repeated measures. In order to appropriate and exact ranking of questioned factors, Friedman's test has been used for determining if the factors differentiate. This test is based on rank sum of observations. It is similar to analysis of variance with the exception that it doesn't need the population normality hypothesis and it uses the ranks instead of data itself. As it is shown in Table VIII, Friedman test is ranking the attributes based on their importance.

Table VII provides the test statistic ( $\chi^2$ ) value (**Chi-square**), degrees of freedom (**df**) and the significance level (**Asymp. Sig.**)

TABLE VII  
FRIEDMAN'S TEST STATISTICS

Number of sample	131
Chi-square	456.220
df	11
Sig	0.000

TABLE VIII  
RANK OF FACTORS

Factors	Mean	Rank
Quality of products	9.05	1
Advanced port management	8.15	2
Port infrastructures	7.72	3
Quality of supplier services	7.27	4
Proficiency Of supplier charges	7.22	5
Outer environmental condition	7.14	6
Price of supplier services	7.12	7
Service speed	6.92	8
Variety of supplier services	6.67	9
Marketing strategy of supplier	5.14	10
Geographical location	3.48	11
	2.11	12

### V. CONCLUSIONS

Ports strategies should be established and implemented by comprehensively understanding the key factors influencing users' port selection.

This study indicates that ship suppliers play important role in attracting shipping companies to the port, so they can increase or decrease number of ships calling to the port.

The empirical results present that sometimes ships in order to obtain their requirements deviate from main route, and select the appropriate port and suppliers, our finding show that *quality of products* that supplied by chandlers (packaging, freshness), *advanced port management* (Promptness of issue document, service speed, custom services, port operation policy, port safety), *port infrastructure* and *quality of suppliers services* are main factors affecting this decision making.

These findings have important policy implications for ports. Since quality of goods that provided by supplier is the most important port choice factor for shipping companies, priority should be given to the building up of this base if port operators want to attract more ships call at their ports. To build up this factor requires several measures as including, decreasing taxes of supplier companies, increasing governmental protection to these companies in order to increasing their competitiveness, obligating the suppliers to follow quality and safety standards. The current study has concentrated on port and supplier selection but has not investigated deviating of ship in order obtaining her requirement from the legal point of view. Therefore it would be a meaningful area for future research.

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