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Designing and Explanation of the Organizational Agility Model of Iran Ports Using Interpretive-Structural Modeling Techniques (ISM)

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Abstract: The main objective of this research is to design and explanation model and organizational agility Iranian ports using the interpretive structural modeling statistical technique. In this study, first identify components and dimensions of organizational agility of ports and then, using confirmatory factor analysis method was used to test the organizational agility. Finally, using the methodology of interpretive-Structural Modeling (ISM) studied and identified the relationship between dimensions of organizational agility of ports and were integrated analyzed. In this study, questionnaire was used to collect the required data. The population of this research have been considered experts and managers of ports and related organizations to Iran maritime transport. The results showed that the organizational agility model of iranian ports has four components, entitled: human resource agility, technology agility organizational factors agility and eventually agility component of maritime transport chain. These components consist of seventeen dimension which interact in achieving of ports organizational agility.

Key words: Population, organizational agility model, Interpretive-Structural Modeling (ISM), dimension, Iran

INTRODUCTION

Today, the importance of ports and maritime transport chain as one of the important components of the economy and its role in developing countries in particular economic development is obvious. Economic development, international trade and transport and marine transport in particular are strongly associated to each other. Globalization and expansion of world economic trade, accelerate trade and has increased transport flows. Now, the share of marine transportation industry in the handling, storage and distribution of goods in international trade, constitute about 90% of total trade. In other words, maritime transport is the foundation and main element of trade and supply chain. According to a report published in the Trade and Development Conference of the United Nations (UNCTAD) in 2013, amounting to 9165 million tons of goods in world has been trade that about 90% have taken place through shipping (UNCTAD, 2013). In Iran, about 93% of export and import of goods is done through the ports and maritime transport chain. Ports of the country, due to the privileged geographical position and being in path of important transport corridors such as North-South and East-West corridor has strong potential for goods transit. But, despite these advantages, according to statistics published by the United Nations Conference of Trade Development (UNCTAD), Iran has tiny proportion of transit of goods and passengers in comparison with other states and even countries in the region. Statistics and information issued by the international organizations, in relation to the ports of Iran performance and other countries particularly competing countries in the region as well as research inside the country, are considered the low market share of the marine transportation industry of Iran from the marine transportation as a result of the following factors:

- Not have the required ability to provide service in accordance with the new needs of the customers (shippers wrestling, shipping lines and other customers) at the lowest cost and time and good quality compared to competitors
- Lack of coordination and synchronization between the development of ports and maritime transport industry and related industries and organizations in Iran, compared with the rapid growth of international and global trade

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Table 1: Rating and performance of Iran logistics in 2007-2014

Iran (Discription)	2007	2010	2012	2014
Efficiency and flexibility of customs clearance procedures (export and import) including speed, ease customs formalities and the quality of customer service	63	106	126	-
Trade and transport infrastructure (network, systems, information and communications, maritime transport infrastructure, particularly ports	66	86	100	-
Flexibility in setting prices (tariffs competitive) compared with the rest of the world shipping industry	78	121	115	-
The logistics service quality and competitive in the world	66	69	87	-
The follow-up tracking	125	110	108	-
Providing timely service and meet customer schedule	106	85	138	-
Iran rank among 155 countries	78	103	112	<115

Table 2: Compares the process of export in four countries in 2013 compared with Iran

Processes	Iran	UAE	South Korea	Singapore (first rank)
Export process steps	-	-	-	-
Document numbers for export	7	4	3	4
Time to preparation export documents (day)	25	7	7	5
The cost of exporting a container (dollars)	1470	630	665	456
The import process steps	-	-	-	-
Document numbers for import	8	5	3	4
Time to preparation import documents (day)	32	7	7	4
The cost of importing a container (dollars)	2100	590	695	439
Document numbers for import	145	26	8	1

This lack of growth is reduced competitiveness and despondence ability to the needs of customers. Unlike Iran, other countries including countries in the region have noted to the issue of organizational agility and the development of their maritime transport industry and thus updated their ports and logistic according to maritime transport market conditions and to attract a larger share of marine transportation market have performed investments extensively in all organization aspects.

The accuracy in the reports published by international resources such as UNCTAD and the World Bank and also internal reports of ports that will be outlined below, affirm inefficiency and ineffective of human resources, processes, performance and logistics and maritime transport chain. Then, will pay to compare the performance of the logistics, productivity of Iranian naval port operations with competed countries and the gap between them to express the need for restructuring and organizational agility of Iranian ports.

World Bank, purposes every 2 years, a comprehensive report on the Logistics Performance metrics (LPI), plus about 155 country survey and highlights comparatively. In this report, six indices considered for the transport chain of countries that performance-based logistics of countries is studied entitled indicators or metrics of the logistics performance. Based on these six indicators the logistics performance of Iran in the 4 year period of 2007-2014 is as follows.

In 2014, because Iran rank among 155 countries is lower than 155 by the World Bank is not included in the statistics. The data Table 1 shows that Iran ranking of every period have declined compared to the previous period. Results of survey released by UNCTAD and the World Bank are summarized as follows.

Iran performance in the six indicators to assess logistics is very weak and ranked 112, compared with 155 countries. What's more, other countries, especially Turkey and the United Arab Emirates in recent years continues to grow, in the six index assessment while Iran has experienced a negative trend in the logistics and transportation

According to the World Bank Report, UAE, China, Saudi Arabia, even Kuwait and Oman Rated logistics more than Iran. The result of which the countries have been able to improve their logistics performance rating that promote environmental conditions and trends of transportation and logistics management to understand the goals and needs of the environment and were designed and implemented their strategies according to needs of environment and transportation market marine transportation market.

Another issue that show the lack of agility and flexibility of processes, structures and high cost of services in Iranian ports is compare the time and cost of two important activities of the ports, means export and import in comparison with other countries. The following Table 2 clearly show this.

World Bank Report 2013: As the above table shows, the cost and time of doing action and number of documents required in Iran compared other countries is high. In better words, Iran maritime transport chain has failed, to better management and offering to lead doing action time, cost and quality of services in accordance with customer demand than competitors are. These factors have caused that Iranian ports propose tiny proportion of the international marine transportation market.

Table 3: Compares the efficiency of Iranian ports with other countries (in terms of ship productivity, containers per hour) in 2013

Ports	Ship productivity in 2012	Ship productivity in 2012
Tian Jean (China)	86	130
Jebel Ali (UAE)	81	119
Yokohama (Japan)	85	108
Bousan (Korea)	80	105
Shahidrajai (Iran)	19	21
Emam Khomeini (Iran)	18	19

Another indicator by which we can measure the ports organizational agility, is productivity indicator of the ship, pier, harbor facilities and human resources or general maritime transport chain. Compare of efficiency index for ships and docks that have been extracted from the World Bank and internal ports statistics show that Iranian ports compared to other countries, especially competing countries have very low efficiency (Table 3).

Resource; UNCTAD Annual Report of 2014 and the internal reports: The accuracy in the results as well as reports released by UNCTAD and the World Bank are confirmed inefficiency and lack of effective processes, structures, human resources, systems and other factors related to maritime transport chain of Iranian ports. These problems has caused that the marine transportation industry's has small share (about half a percent) of international maritime transport market and be behind from their 1404 horizon programs (UNCTAD, 2013). So, what can be concluded from the above, is that, ailing and simplifying of processes and structures, organizational factors, human resources and technological and maritime transport chain of Iran has become a requirement. The purpose of this study is designing and explanation of organizational agility model in order to enhance the position of Iranian ports compared to competitors, increase market share and achieve the 1404 program and ultimately achieve the strength economic theory in marine transportation industry.

Theoretical fundamentals and literature

Definitions and the concept of agility: Agile word in the dictionary, means to move fast, agile and active and agility is ability to move fast and easy and being able to think quickly and with a clever method (Ganasekaran and Tirtiroglu, 2002). Andrea (2012) has been defined agility to respond and adapt to changes and fluctuations in the market with a fast and steady economic method that means the ability to meet the needs of customers in terms of price, quality and speed of delivery. In other words, that proposed by Andreeva (2008) defined the concept of agility is ability to flourish in an environment with constant change and unpredictable conditions. He believes that organizations should not be afraid of changes in their working environment and to avoid them but should considered change as an opportunity to gain competitive advantage in the competitive environment market. Most of the scholars and researchers in their definition of agility emphasize on the variable and unpredictable environment and ability of organizations to adapt and keep pace with such environmental. Some scholars believe that adaptation to the environment, through agile of human resources and organizational factors such as design of organic organizational structure (Attafar, 2012).

According to the definitions and agility concepts above can be said that the current organizations are active in an environment that is rapidly changing and unpredictable, forced them to have adaptation strategies. In fact, this problem that how organizations can succeed in a dynamic and unpredictable environment and something that is known as the most important challenges of today's world. Agility's strategy can be defined to survive and promote in a competitive environment which an essential feature are change and uncertainty, that react quickly and effectively to changing markets based on customer demands (Azar *et al*., 2011). Approach of changes and agility of ports and maritime transportation chain that closely related to international and global trade and every change in international environment and market affect them, are not exception. Chances made in supply chain management, has a huge impact on this chain. Shipping lines, terminal operators, shipping agents and forwarders have to offer a wide variety of services and activities in order to satisfy their customers. Providing services in accordance with customer demands require high innovation and flexibility. Therefore, all organizations associated with the chain of maritime transport and ports must be agile, to have the ability to adapt to the environment.

Models and organizational agility studies: Since, the advent and widespread the paradigm of agility, thinkers and leaders of organizations in order to agile their organizations, offered agility from different approaches and different models with different dimensions. To understand the dimensions, the tools and functions of agility refer to some of the models that are the basis for the preparation of the conceptual framework of this study that mentioned in Table 4.

Table 4: Factors and organizational agility dimensions of the components of the conceptual framework

Criterion	Agility dimensions	Source (designer and author of the agility)
Human resource agility Dahmardeh,	Staff education and empowering	Beskovnik *et al.* (2011), Joseph, Ganaskaran and Joseph, Ganaskaran and Dobby, Sharp, Bishop (2013), Abayar, Olfat *et al*, J. Race
	Knowledge based human resources development	Joseph, Ganaskaran and Joseph, Dahmardeh, Sharp, Ziaee
	Global management developing	Ganaskaran and Joseph
	Developing of IT skills staff	Ganaskaran and Joseph, Ganaskaran, Sharp, Azar *et al.* (2011) Olfat
Technology agility Dobby	Network and advanced system	Sharifi (1999), Joseph, Ganaskaran and Joseph (2008), Svhan.v model, Ganaskaran and (2014), Toliusiene and Mankute, Sharp (1999), Ziaee, etc.
	Advanced loading and unloading equipment	Maritime transport industry
	Advanced Maintenance System	Maritime transport industry
Organizational factors	Agile organizational structure	Sharifi, Joseph, Sv. han. vv model, Toliusiene and Mankute, Dahmardeh, Momeni, agility, Abayar
	Agility operational processes and support	Lin, Beskovnyk *et al.* (2011) J. Race
	Organizational Agility Strategies	Sharifi, Ganaskaran, Joseph, Dahmardeh etc., Momeni, etc.
	Customer Relationship	Joseph, Lin, etc., Su.han.voo model, Ganaskaran and Dobby, marine transportation industry
	Lean services	Maritime transport industry
	Promote safety and maritime services	Maritime transport industry
Supply chain agility	Taking advantage of the transportation door to door	Souhan.voo Model, Supply Chain Model, maritime transport industry
	Maritime transport chain relationship management (-port-ship-goods owners	Lin, etc., Souhan.voo model, Bskvvnyk and colleagues, supply chain model, Ganaskaran, Hong Lai and cheng, marine transportation industry
	Logistic agility	Sv.han.v model, Beskovnik Supply chain model, marine transportation industry
	Orientation to third generation ports	Beskovnik *et al.* (2011), maritime transport industry

Table 5: Results of fitting model organizational agility indicators at Iranian ports using confirmatory factor analysis

Fitness index	χ^2	Freedom degree (df)	χ^2/df	RMSEA	CFI	TLI = NNFI	NFI	GFI	IFI	AGFI
Asses criterion		0≥	2≤	0.05≤	0.09≥	0.09≥	0.09≥	0.09≥	0.09≥	0.09≥
Results	142.08	113	1.26	0.034	1	1	0.99	0.99	1	0.99

MATERIALS AND METHODS

In this study, first by using confirmatory factor analysis was examined the basic conceptual framework and with regard to that the results of confirmatory factor analysis, indicated the appropriateness of the fit model of studied population, the dimensions of this model was interpreted as base of analysis in the analytical-structural modeling (Table 5).

Structural-interpretation modeling: To using the interpretive-structural modeling, have to follow process below steps and processes.

Step one; identify the agility dimensions: Interpretative-structural modeling starts with the identification and definition of variables. In this study, was used model of organizational agility of ports by using confirmatory factor analysis and confirmation test?

Second step; get the Structure Matrix of Internal relations variables (SSIM): After studied, identified and defined organizational agility variables population must be entered internal relations variables in the matrix structure. This matrix, is a matrix in variable size that it first rows and columns are mentioned in the order. In this study, 17 variables defined to Iranian ports organizational agility model; that the Internal Structural Matrix variables (SSIM) that performed by using proposed method of bloats (2005) to determine the relationships among them. According to this method, in the first matrix instead of four usual marks in structural-interpretation modeling use four choice range. So, to determine the relationship between organizational agility ports were used of seventeen dimension of following scales:

- 3: Agent (dimension) row i is quite effective on column j operator (high impact)
- 2: Operating on a row i column j effective (medium impact)
- 1: Row have little impact on column j (low impact)
- 0: row i is ineffective on column j operator (ineffective)

So, by using this method sat a questionnaire (matrix) and were distributed between 15 numbers of the experts to identify the effect of dimensions to each other. The collected results of the questionnaire and were recorded together in a table called a matrix of variables. Since, distributed and completed questionnaires were 15 cases

in each of the structural matrix of internal relationships put numbers between 0-45 matrix of internal relationships.

Step three: In the third phase should be action to design achieve matrix. This matrix were obtained by determining the internal relationships of variables in the form of ones and zero that achieved in the second step. To do this, we must first define single numerical scale using Bolatos Method, etc. and compared with the previous step table numbers. If the relevant number in the table be larger than scale number, in the new table will use number one and otherwise use zero. In the other words:

- If (aij = m thus aij = 1
- If aij<m then aij = 0 determined

Bloats and colleagues to define and explain the scale number used the following formula:

$$M = 2 \times n$$

M = Number scale
n = Number of collected questionnaires (for this study n = 15)

$$M = 2 \times 15 = 30$$

At the next step, the obtained matrix in the first step is summarized with unit matrix.

$$Rm = m+I$$

RM = Access matrix
M = Matrix obtained from the first stage
I = Unit matrix

Step four: In this step will be determined the levels of agility factors or dimensions. To determine the priority level and dimension should be set, achieve set and prerequisites setfor each factor. The achievement collection of each factor are including factors that affected from operating and prerequisites set is consist of factors that influence these factors and the impact of factors or dimensions on each other is obtained by using the access matrix. After determining achievement set and prerequisite set of each factor identified common elements for each of the two categories for each factor. Then is time to determine the levels of factors. In the first table, the factor which has the highest level that its achievement set and common elements are completely identical. After the determination this factor or factors level, we will remove them from the table and continue with the rest of the matrix elements and found the second leveling continue it to determine the level of all sizes and dimensions. In this study, during nine step, determine the nine levels of organizational agility of ports which for reasons of brevity.

RESULTS AND DISCUSSION

According to what was mentioned previously, one of the characteristics of interpretive-structural modeling or ISM is priority or ranking of a research model dimensions. On this base, dimensions which set in the first level are the result or effect the next levels. This method, in addition to present separate models of priority, help to the implementation of the model to organizations. For example, the research model of organizational agility of this research, logistics agility and changing the ports to the third generation ports are the first level or priority. These two dimensions affected from other dimensions particularly the original Marine services. As regards to other aspects. Interpretive-structure modeling in addition to factors level determine draw the impact of relations to each other. Table shows the variables relationship in the Structural-Interpretation Model.

MICMAC analysis: The last step of using of interpretative-structural modeling, is identifying and determine the leading power and dependent variables or model dimensions, leading power is obtained of the sum of numbers in a row for each agent power dependence of the sum of the numbers in a column of each agent (dimension) (Table 6).

After calculating the leading power and dependence of dimensions, they must be analyzed using the MICMAC technique. In analyzing MICMAC, the dimensions of organizational agility in terms of power and dependence

Table 6: Determining the leading power and dependency of organizational agility model dimension of marine transportation industry

Critrion	Leading power	Dependence power
1	7	1
2	7	3
3	3	4
4	5	3
5	8	4
6	6	2
7	4	3
8	5	7
9	6	9
10	3	3
11	4	5
12	3	7
13	5	4
14	5	4
15	4	6
16	2	6
17	2	7

guide is divided into four categories. This dividing is shown in figure one at below. The first category are including independent variables. This dimensions, given that are not connected to the system or organization have little or weak connection with the system. In this study, despite the fact that three dimensions of Ports organizational agility including the Developing Management (Global managers), advanced repair and maintenance system and agility of strategies are in this category but as shown in the figure, these dimensions were formed in the upper edge of the first quarter. So, it can be concluded in relation to these dimensions that it has leading power and average dependence power in comparing to other dimensions of organizational agility of maritime transport chain of Iran. Second category entitled, low power dimensions and high dependency, classified. These dimensions are low guide power but high dependence. Customer relationship management variables, port and sea pure services, maritime transport chain agility, logistic agility and attitude toward third generation ports are categorized in this group. This dimensions are in fact are results or performances of organizational agility of the ports studied: that factors or other dimensions of agility involved in creating them but they can less be a precursor to other dimensions.

Again, look to the third part of the figure, lead power and dependence, the third category of factors are identified. In fact third category are dimensions or connected variables that have high lead power as well as high dependence. This types are of dynamic variables because any changes in them can affect the rest and ultimately deemed organization system, other, in the other hand results or system feedback can also change these variables again. Two factors of organizational structure agility of operational and support processes.

The fourth category includes independent variables that has strong leading power but weak dependence power. These variables are fundamental and basic variables and in order to organizational agility of marine transportation industry must first consolidating and strengthening them. In other words, strengthen those leads to agility in other aspects and ultimately organizational agility. Education agility and staff empowering, knowledge-based human resources development, staff development by IT skills, advanced information systems and network, advanced loading unloading equipment, enhance maritime safety and port services and using the method of transport of door to door have such features.

CONCLUSION

The results indicate that the three major aspects, namely education and staff empowerment, knowledge-based human resource development and IT skilled staff are basis of organizational agility model of maritime transport chain (the ninth level). This means that for the organizational agility in the systems should be started of these dimensions or criteria. The performance result of these dimensions, provided the field of higher levels of agility factors (structures-processes-strategies, etc.).

After strengthened and empowered human resources have the necessary means to achieve the effectiveness of ports performance of and other related organizations put at their disposal. One of these important tools are deploy and manage integrated network and information technology systems. These system will be used for rapid coordination and effective organizing of maritime transport chain. Also, this system, effectively helps to maritime transport operators, in a quick and timely reflection of the needs and tastes of customers (shippers-ships and other port and maritime community members). From other amenities needed for port and marine services is using loading and unloading equipment and infrastructure as well as up to date repair and maintenance system. These factors are effective on the side loading and unloading of goods. As mentioned in the preceding pages speed of port and maritime operations, are considered as one of the most important criteria for customers and product and ship traffic. After above dimensions and factors, other dimensions like agility organizational structure, flexible and agility operational and support processes, agility strategic planning are include organizational dimensions that empower human power use them to achieve goals and promote industry position and maritime transport chain. Existence of organic organizational structure and enabling (not preventive), simple and short processes and strategies in accordance with the business day conditions of maritime transport and logistics, in addition of chain agility, improve the position of ports and obtain transship share of region ports and in particular Jebel Ali Port. In addition to these aspects, it has a considerable impact taking advantage of new integrated transport methods, such as door to door transport system, maritime transport chain management at organizational agility, reduce costs and time and the consent of the cargo owners and shipping lines. Effect of this dimension will become more significant when the maritime transport operators by deploying modern maritime safety systems and also

communication with customers, understand their needs and could be offered services commensurate with the wishes of the customers.

Another important factor that has high impact at all levels of operations and levels of organization, in reducing costs and time and customer satisfaction, is deploying lean service approach. Third generation ports tendency and logistics agility are considered as the ultimate dependent variables, that are affected of results and performance of the eight bottom levels and organizational agility of maritime transportation industry is the result of it.

Interpretation-Structure Method (ISM), provided other interesting concerning results related to leading power and dependence of the organizational agility dimensions. MICMAC analysis showed that the dimensions of education and staff empowerment, knowledge-based staff development, networking and advanced information systems, advanced loading and unloading equipment, employees by IT skills, lean services and orientation to third generation ports has a strong lead power but weak dependence. Therefore, this category of infrastructure agility models constitute maritime transport industry and should be emphasized. Two organizational structures and operational and support processes has high lead power and high dependence. These dimensions are dynamics that every change in them can affect the entire system. Therefore, the performance of maritime transport logistics chain and increase their rank and port and maritime index are depend on them. Other aspects of agility are mentioned, connected and dependent to first and second category dimensions.

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