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DELPHI- SWOT tools used in strategic planning of the Port of Manta

Mariela Macías Párraga[a], Nicoletta Gonzalez-Cancelas[a], Francisco Soler-Flores[a]*

[a]*Civil Engineering. Transport, Universidad Politécnica de Madrid, Madrid, Spain*

Abstract

Latin American ports are continuously growing, prior research were focused on the Panama Canal, but nowadays South American ports which are the gateway to America and Asia become important and are the new focus of port investigators, for this reason South American ports compete, promoting their strategic locations and facilities for the arrival of large ships. This paper aims to apply tools like Delphi and SWOT analysis for strategic planning of the Port of Manta. SWOT Analysis quantitative model and expert judgment Delphi Panel which consists of practical and theoretical experts who have knowledge of the reality of the Port of Manta and researchers in logistics and international shipping. The strategic proposal for the specific case of the Port of Manta is based on offensive strategies which are the ideal position for the port that lead to rapid growth in the maritime market.

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Keywords: port; multimodal transport; logistics; SWOT analysis; Delphi

1. Introduction

Ecuador, officially the Republic of Ecuador, is a country located in the northwestern region of South America. Ecuador is the third fastest growing economy in Latin America and is currently one of the countries that has the lowest unemployment rate in America and around the world. The economic dynamism that is achieving the country is reflected in economic growth of 5.2% year on year, according to data from the Central Bank of Ecuador. It features a high growth in the aquaculture sector, which is also reflected in a significant increase in employment in the fisheries sector. Ecuador is one of the countries with greatest biodiversity and mineral resources in the world, with unique plant

* Corresponding author. Tel.: +34 9 13 36 53 57; fax: +34 9 13 36 53 57
E-mail address: mj.macias@alumnos.upm.es (M. Macías), nicoleta.gcancelas@upm.es (N. González), fsoler@upm.es (F. Soler).

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and animal species and the only one in the world that has in its constitution the right to environment (Denis, 1976). Seaports are a remarkable point in trade and tourism, that is why its modernization in recent years has allowed to ports like Manta can reach large cruise and cargo ships and others. Another port of great importance is that of Posorja in the Gulf of Guayaquil, mostly cargo. Port Bolivar in Machala is mainly for agricultural exports such as bananas, shrimp, cocoa, etc. Port of Esmeraldas is mainly for industrial export of oil, gas and petroleum products (Prado, 2010).

The Port of Manta can be integrated into multimodal logistics in Latin America, but requires action strategy Manta Port Authority should take the opportunity to have again to operate the Port of Manta, to make it a transfer port.

It is imperative that as a precursor to investment by the state are made proposals Analysis methodology grounded in being vital tools for planning, is the reason why this study become important and has attracted interest from the Port Authority of Manta, being the only one who has been interested in expert judgment involved directly with the port for their proposals and exchange views allow positioning the port of Manta among the most important in the region (Quijada-Alarcon, González-Cancelas, Camarero-Orive & Soler-Flores, 2012) (Matotek, 2012).

2. Methodology

The methodology used in this study gives a general view of the state of the Port of Manta and recognize the strategies proposed to achieve integration into multimodal logistics in Latin America (Macías, González-Cancelas, & Soler-Flores, 2013).

Continuing the investigation in this issue will present the results of the application of the methodology. In a systematic and summarized way it will outline the methodology.

The methodology consists of four major blocks:

- Determination of the job scenario: SWOT Matrix
- Assigning weighted grades: Delphi Panel
- Descriptive statistical analysis of weighted grades
- Decision making: Strategy

Fig. 1 shows a synthesized form each of the blocks that form the methodology, they allow obtaining proposals for the integration of the Port of Manta in multimodal logistics in Latin America from completing a SWOT analysis by an expert panel (DELPHI).

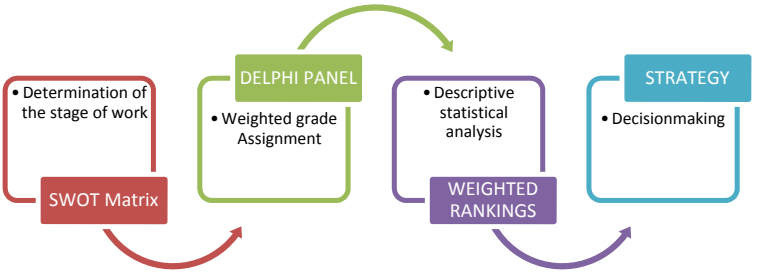


Fig. 1. Methodological process

2.1. Determination of the stage of work: SWOT Matrix

Of the four Ecuadorian ports, the working stage where it will be applied the SWOT matrix is the Port of Manta, the interest is that it has a favorable condition to become hub port in Latin America and it is thought it can be exploited

to its maximum potential through research with real data in order to develop proposals and strategies to put it into the main ports of navigable routes from Asia to South America.

In this year the Port of Manta faces great challenges as a millionaire public investment, foreign investor visits, the administration of the Port Authority in autonomous regime, projected to be part of the Manta-Manaos multimodal corridor that connects the Pacific Ocean with the Atlantic Ocean; all these combined to supply its hinterland and foreland. All this makes it necessary to undertake studies as proposed by planning tools that allow the Port of Manta position as a hub port in the multimodal logistics in Latin America.

2.1.1. Analysis SWOT

The technique used to estimate the strategy to take decisions regarding the Port of Manta is the SWOT, which allows identification of strengths, weaknesses, opportunities and threats of the Port of Manta, in Fig. 2 shows the parameters involved in this analysis.

Before taking any strategic decision, it is essential to diagnose the Port of Manta. SWOT analysis is the most simple and effective method to decide on the future. It will help raise the actions to be put in place to take advantage of opportunities and to prepare the port detected threats being aware of their weaknesses and strength (Talancón, 2006).

The main goal of a SWOT analysis will help the port meet their critical strategic factors, for once identified, use them and support organizational change: consolidating the strengths and minimizing the weaknesses, taking advantage of opportunities, and eliminating or reducing threats. The SWOT analysis is based on two pillars: the internal analysis and external analysis of the port.

Fig. 2. Parameters involved in the SWOT analysis

For a better understanding of the application of SWOT analysis, the major Strengths, Weaknesses, Opportunities and Threats of the Port of Manta will be described.

Strengths of the Port of Manta are special abilities, controlling resources, possessing skills, activities developed positively and thus has a privileged position compared to the competition regarding the shipping and logistics potential (González Cancelas, 2007). Its comparative advantages are associated with having an open sea access to 25 nautical miles from international maritime traffic route, without natural channels, with depths of 12 meters at the lowest tide, allowing the entry of big ships 24 hours a day, 365 days a year, with no time standby, making it an attractive investment port

Opportunities are those factors that are positive, favourable, and exploitable, that should be discovered in the environment in which the port of Manta operates, allowing to obtain competitive advantages over nearby ports.

Currently the most significant opportunity for the port of Manta is the national government's commitment to build the deepwater port, the public investment will reach $ 106 million.

These investments should also be addressed to improve the corridors taking into account external costs and better access to the Port of Manta (Bína, Cerny, & Novakova, 2012). Also it has to be considered creating development policies of Railway Transport in developing countries like Ecuador that will allow intermodality and co-modality in the transport of goods from the port to the hinterland and foreland (Odeleye, 2012). Development corridors as the Mega Manta-Manaus project are opportunities which aim investment in transport infrastructure in order to create an enabling environment for economic growth and development in South America (Campbell & Hauptfleisch, 2012).

Weaknesses: are those factors that cause an unfavorable position against the competition with regional and international ports, lacking resources of the port, skills which does not possess in port logistics, activities that do not develop positively, in short, everything what has prevented the port integrates multimodal logistics in the region. It has been identified as a weakness of the Port of Manta burden not having own, except seafood, but are shipped through the Port of Guayaquil, due to lack of shipping frequencies (Delgado, 2011).

Threats: are those situations from the environment of the port and can reach even attempt against the permanence of it. In the present study, it is recognized as a national competition threatens the port of Guayaquil and international ports like Callao in Peru.

2.1.2. Development SWOT Matrix

The aim of the analysis phase is to establish an information system, build the schema SWOT (Table 1), the basis for planning and identify critical factors for success. This requires:

- Identify the stakeholders
- Analysis Internal / External on questionnaire EFQM (European Foundation for Quality Management)
- Identify the competition
- Establish a monitoring system
- Establish an information system
- Identify key processes

Table 1. Matrix of diagnosis SWOT

	O1	O2	O3	O4	O5		A1	A2	A3	A4	A5		total
F1													
F2													
F3													
F4		**OFFENSIVE**						**DEFENSIVE**					
F5													
						1						2	F 1+2
D1													
D2													
D3													
D4		**ADAPTIVE**						**SURVIVAL**					
D5													
						3						4	D 3+4
total						O 1+3						A 2+4	

The SWOT matrix is composed with the strengths, weaknesses, opportunities and threats identified in the Port of Manta, these parameters have been identified after an extensive literature review and supplemented by expert judgment by members of the UPM Department of Civil Engineering and Transport, of the research group LET&GO.

Strengths and Weaknesses vs. Opportunities and Threats are confronted in this matrix, that allows us to recognize the scenarios offensive, defensive, adaptive and survival facing the Port of Manta.

Offensive strategies are the ideal position: rapid growth and achievement of the objectives. The port of Manta is prepared to deal with threats. If your service is no longer considered a leader in multimodal logistics chain, you must

highlight what differentiates you from the competition, for example their access to open water 25 miles nautical without channels and with natural depths of 12 meters in the tidal low.

Defensive strategies are to face the threats. Manta, as transfer port, must adopt a strategy of growth (González-Cancelas & Camarero-Orive, 2009), when strengths of Port are recognized by shipping agencies and international investors.

Orientation strategies when opportunities arise as to benefit, but there is no adequate preparation. At this time the Port of Manta has a unique opportunity with the investment commitment by the Government to increase to $ 106 million, but the port itself has no charge, no shipping frequency, small administrative and technical staff that allows absorb this investment. It will require new hires and diversify existing port services because they are not giving the expected results.

Survival strategies are used to combat threats when you do not have the necessary strengths. The port of Manta faces external threats such as competition with ports in the region and international terminals like Callao - Peru, without internal forces needed to deal with the ports that are in the same path of international maritime traffic. It is advisable to leave things as they are until they are seated changes that will occur with the new state investments (González & Camarero, Alberto y Pardillo, José María, 2007).

2.2. Weighted grade Assignment: Delphi Panel

The objective of the Delphi group in this study is the achievement of a consensus based on the discussion between experts involved with the Port of Manta, as well as external consultants, they will give weights in a survey to the relationship between parameters: Strengths vs. Opportunities, Strengths vs Threats, Weaknesses vs. Opportunities and Weaknesses vs Threats (Astigarraga, 2003).

In a matrix as in Table 1 strengths and weaknesses are confronted with opportunities and threats listed in Table 2, the group of experts Delphi will respond to a survey consisting of a matrix, we choose the score with range of 0-5 (5 being the highest relationship between parameters).

Table 2. An example of a table.

	STRENGTHS		**OPPORTUNITIES**
F1	Location geostrategic	**O1**	State investment in the Port
F2	25 nautical miles to the International Maritime Route	**O2**	Transfer Port concession
F3	Port facilities	**O3**	Creating Pacific Refinery
F4	Logistics cluster	**O4**	Project Manta- Manaus
F5	Multipurpose port	**O5**	Settlement of Industries in the city
F6	Port Authority Autonomy		
F7	International Safety Certification		
F8	Natural Draught 12 m		
	WEAKNESSES		**THREATS**
D1	Location within the city	**A1**	Centralization of Management port in Guayaquil
D2	Lack own load	**A2**	Law ports on modification process
D3	Lack of shipping frequencies	**A3**	Customs exhaustive inspections
D4	Road connections	**A4**	Competition Peruvian ports (Callao)
D5	More time in port (131,89 Hrs / ship. For hours ship)	**A5**	Limit the rehabilitation of existing port facilities
D6	Lack of technology		

Questions to ask the expert before assigning a score between parameters: What score deserves the relationship between these two parameters? Does it affect a lot or a little?, Fig. 3 lists the scoring options having the expert panel and the meaning of each.

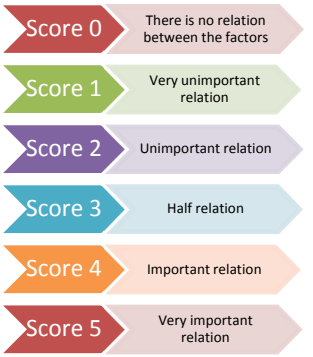


Fig. 3. Score rank of SWOT Matrix

There will be two rounds of survey to the Panel of Experts, at the end of the first round, after receiving the information, it returns to conduct another survey based on the above to be answered again, is justified as a feedback process to the same experts as part of a survey next round (next-round). Then experts revalued their views in the light of this information, and group consensus tends to emerge.

2.2.1. Selection of expert panel

A careful selection of experts has been made, so that the results are as attached to the reality of the Port of Manta.

The Expert Panel is composed of two groups: practical and theoretical (Fig. 4). Experts theoretical are composed by researchers and consultants (universities, consultants), while practical experts consist of managers and port stakeholders (shippers, trade chamber, Port Authority).

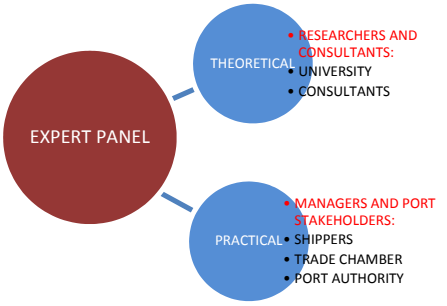


Fig. 4. Delphi Group Members

It's really interesting to compare the views from both perspectives; within the results the most relevant will be reported.

It should be noted that this survey is only enabled for the group "Delphi", this is possible from a virtual platform

that is accessed through a link to give their score and allow it to feed the database.

2.3. Descriptive statistical analysis of weighted rankings

At the time of having all the data, conclusions will be drawn up from the statistical exploitation of the data obtained, there will be the support of programs Matlab ® and LABBTEX (Soler-Flores, González-Cancelas, Camarero-Orive, Monzón, & Gárate, 2012). Toolbox for LaTeX reporting for Matlab ®. LABBTEX is a software developed by Team H3lite within the Department of Civil Engineering, Transport, School of Civil Engineering of the Polytechnic University of Madrid

2.3.1. Detailed study of SWOT Matrix

The shape of the survey based on SWOT analysis allows the detailed study in quadrants so they can be compared: offensive, defensive, adaptive and survival, in order to define which quadrant have receive the highest score from the DELPHI panel. In addition there will be a study confronting theoretical expert opinion with practical experts, with a final study full expert panel.

2.3.2. Descriptive statistics study

The descriptive statistical study allows to know the result of consensus of the expert panel DELPHI, to see ratings trends, to recognize the strategic quadrant on which the proposed strategies will be focus, in addition to notice the best opportunity and the worst strength. It is very thorough analysis which includes the following studies shown in Fig. 5:

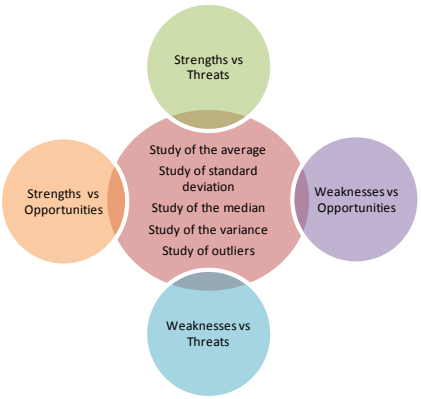


Fig. 5. Descriptive statistics study SWOT matrix

The representation of these data will be done by quadrants according to a statistic parameter, they will be distinguished by the intensity of colors, being redder tones which reach highest score and the most blue which correspond to a lower score.

To improve visualization and understanding of the results, they are presented in 3D graphics with the respective quadrant scores and DELPHI Expert Panel.

2.3.3. Status of minimun for weighted grades

For decision making, ie the strategies approach from quadrant with the highest score, which is the strategic quadrant, requires a minimum score for each factor. In the case of factor Xi and lower XiYi relationships should be increased, based on the criteria considering strategies involving each Xi and XiYi should be at least equal to or greater than the median variable center position of ordered data set.

3. Results

In this first round of surveys the results of the study of the average of the weights of the SWOT matrix will be present in quadrants. The results obtained are shown in Figure 6:

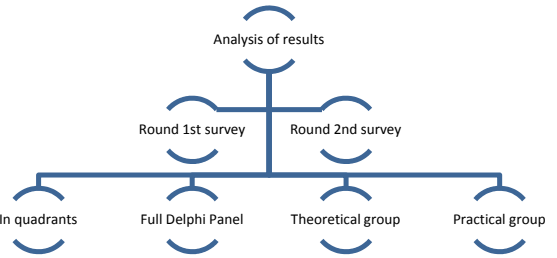


Fig. 6. Study of Delphi Panel qualifications of SWOT Matrix

Full Delphi Panel in two rounds of surveys assigned weight grades for each quadrant, the results obtained by the full expert panel are shown in Table 3.

Table 3. Full Delphi panel ratings for each quadrant

First round		Second round	
Quadrant I	Quadrant II	Quadrant I	Quadrant II
99,3	63,05	104,78	65,67
Quadrant III	Quadrant IV	Quadrant III	Quadrant IV
75,55	77,35	81,81	75,68

In Tables Table 5 and Table 6 the results of the strategic quadrant improvements are shown, which have been punctuated by the expert panel completely in the second round of surveys, where goes from the current situation with the weights of the expert panel to the new situation enhanced by the condition that the minimum score is equal to the median, this is only possible once you have implemented all the strategies.

Table 4. Quadrant I current score (f/o). Full Delphi Panel, second round

F/O	1	2	3	4	5
1	4.15	3.72	3.94	4.28	4.00
2	3.23	3.47	4.11	4.01	3.75
3	3.94	3.51	3.26	3.42	3.35
4	3.27	3.38	3.25	3.87	4.02
5	3.76	3.49	3.63	3.71	3.86
6	2.87	2.95	2.47	2.98	2.72
7	3.52	3.41	3.22	3.48	3.19
8	3.66	3.86	3.80	4.04	3.16

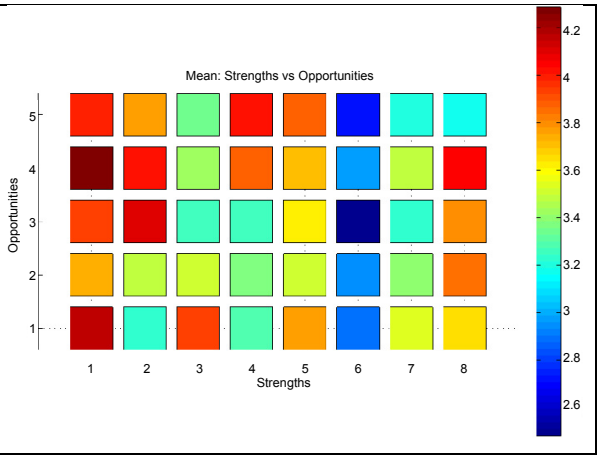
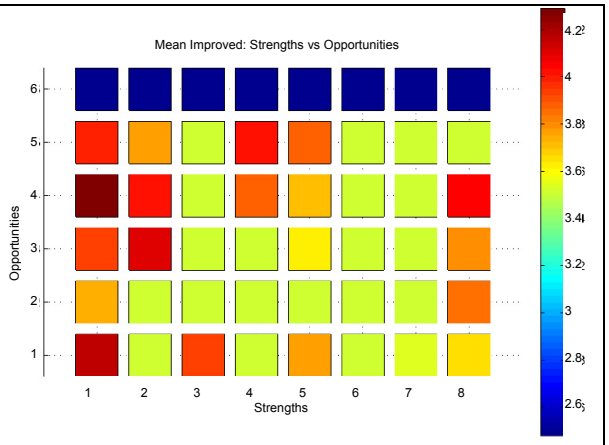


Table 5. Quadrant I improved situation (f/o). Full Delphi Panel, second round

F/O	1	2	3	4	5
1	4.15	3.72	3.94	4.28	4.00
2	3.52	3.52	4.11	4.01	3.75
3	3.94	3.52	3.52	3.52	3.52
4	3.52	3.52	3.52	3.87	4.02
5	3.76	3.52	3.63	3.71	3.86
6	3.52	3.52	3.52	3.52	3.52
7	3.52	3.52	3.52	3.52	3.52
8	3.66	3.86	3.80	4.04	3.52



The improvement of Quadrant I is based at the same time on improving relations between the strengths and opportunities, as shown in Table 7 are 20 relations F / O that should improve its score through strategies.

Table 6. Relations xiyi to improve in quadrant i (f / o). full delphi panel, second round

O1	O2	O3	O4	O5
F2	F2	F3	F3	F3
F4	F3	F4	F6	F6
F6	F4	F6	F7	F7
	F5	F7		F8
	F6			
	F7			

4. Conclusions

The most relevant conclusions which have been reached after developing SWOT analysis methodology and Delphi Panel at the Port of Manta. It is emphasized that the essential conclusions which achieve the main objective of this work, are focused on the approach of strategies, in the same give details of strategic planning of the Port of Manta.

The working scenario which develops SWOT Matrix is the Port of Manta, where it is concluded that it is possible to exploit it to its full potential with investigations as proposed in this work and by port planning tools that allowed you to formulate strategies that placed as a hub port in Latin America.

It follows in the two rounds of surveys sent to the full panel and the two groups of experts that the best fortress port of Manta is F1: geo-strategic location, being the most valued reveals that it will support the port to promote their short and long distance services as a hub port for both foreland and hinterland.

It is stated that the consensus reached by the full panel of experts and expert groups shown in the selection in the two rounds of surveys of the best opportunity O4: Blanket Project - Manaus, reflecting the hope that this ambitious project multimodal logistics dawns is the Manta port as a hub port. Also the worst opportunity is O3: Creating Pacific Refinery, this indicates that the Port of Manta will not draw most of this project will require the nearest port for exclusive use.

It is noted that for the full panel of experts and expert groups under the application of a consensus in the first round of surveys choose D2: Lack own load as highest scoring weakness, undoubtedly this weakness has limited port Manta in its development and has been conditioned to be a port mostly of cruises with little moving cargo.

In the second round of survey the full expert panel gives the highest score to D6: Lack of technology, this change in approach is justified by globalization which requires the use of the latest technology to beat the competition, this should reverse the Port of Manta to position itself as a hub port.

It is emphasized that the threat factor that received the highest score according to the criteria of the full panel of experts in both rounds of survey is A4: competition with Peruvian ports (Callao), this situation comes from the South American port environment where it competes the Port of Manta, in this the Callao port highlighted by large volumes of cargo that moves and its position in the Latin American ranking in such a short time.

The theoretical panel matches most with the full panel, while the theory group is showing greater differences

We conclude that decision-making is based on implementing an offensive strategy for the Port of Manta, given for the highest score received Quadrant I: Strengths vs. Opportunities, being the ideal position for the port under study.

In summary it can be concluded that among the most important actions to be implemented include:

- Making investments in the Port of Manta both access to the port and connections, as well as in plant and equipment, in order to modernize, automate and specialize the port, especially in container traffic. While should be increased port draft.
- Creating a logistic cluster associated with port which can exert a leadership position in the sector, in order to conduct a marketing function of the benefits and potential of the Port of Manta, especially those relating to its strategic position within sea routes.
- Harnessing empower Manta Port Authority to develop all these elements that improve the strengths and opportunities that already has the port.

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