

An Analysis of the Singapore Logistics Industry

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싱가포르의 물류산업의 분석

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Abstract

물류산업은 세계의 모든 정부 및 국가기관에 의하여 최고로 인식되고 있는 전략적이고 경제적 이윤추구의 전 세계에 걸친 거대한 산업이다. 싱가포르는 물류산업이 가장 발달하고 최고로 바쁜 항만을 갖고 있는 국가 중의 하나이다. 싱가포르의 강점은 아시아에서 훌륭한 문화여건, 금융과 상업적인 클러스터, 통신 및 운송의 연결성을 가지고 있는 가장 세계화된 도시라는 점이다. 싱가포르는 우수한 물리적인 산업기반 시설의 장점에 의하여 자유경쟁의 이득을 향유하고 있다. 그렇지만 이러한 것들만으로는 싱가포르가 우리들의 경쟁자로서 앞서 있다고 확신하기에는 충분하질 않다. 싱가포르는 적은 인구나 지지배후지의 부족 등으로 도전에 직면하고 있어서 배후지를 다른 국가로 이전하고 있다. 싱가포르는 세계 경제 속에서의 국제화 중심이 되거나, 남동아시아 성장에 참여하고 배후지의 결속을 증가시키는 선택을 해야 될 것이다. 따라서 이 논문에서는 싱가포르 물류산업의 전략적 발전을 분석하기 위하여 수리통계학적 방법을 적용하였다.

Key words : 싱가포르, 물류, 배후지, 세계화, 에이피에이치, 스와트

I. INTRODUCTION

1. Logistics Industry

Logistics industry is dynamic and constantly changing, being dependent on several factors such as the stage of development of a country, global economy outlook and prevalent social issues such as threat of terrorism. Thus, it is appropriate to look into the broader perspectives of the global logistics industry, underlying trends and emerging issues that may influence or explain certain performance or characteristics of each country. The

privatization of ports is taking place in terms of both part privatization of existing public ports and terminals and other port related services as also new terminals and Greenfield port projects¹⁾. With the development of liner shipping and container cargo trade, the demands on port infrastructure have become quite intensive both in respect of level of capital investment as also highly sophisticated

1) Greenfield port projects which do not create any environmental nuisance, follows environmental management system and environment impact assessment.

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technology for container handling. Growing importance of Information Technology(IT) promises to make port operations highly cost-efficient and substantially improve cargo handling turnaround times.

The logistics industry is undergoing changes revolving around globalization, outsourcing and increasing IT application. Globalization has led to the emergence of large container vessels to capitalize on the international trade and there has been increasing alliances among shipping lines for rationalization of investment and gaining marketability through a wider network. Logistics companies are exploring ways of differentiating from the competitors by providing value-added services and forming strategic alliances with customers for a sustainable win-win relationship, as well as the use of IT to integrate across supply chain partners, provide better visibility and improving customers' processes.

logistics industry, logistics in Singapore is a dynamic and fast-growing industry, contribution to about 8% of Singapore's gross domestic product³⁾. Singapore maintains its international competitiveness and attractiveness as a logistics hub even as competition increases in the region.

Singapore, up one rank from last year and now at seventh place, draws its greatest competitive advantages from the efficiency of its markets-goods, labor, and financial- where it ranks in the top 3 in the world for each pillar. The country also gets excellent marks for the strength of its public and private institutions. Singapore also has world-class infrastructure: its port and air transport infrastructure are both ranked first among 131 economies. But Singapore's competitiveness is hindered by its small domestic market size and mixed performance in the macroeconomic stability pillar due to relatively high interest rates and government debt of more than 98 percent of GDP in 2006, which placed the country 115th on this indicator.

<Table 1> Economic growth of Singapore²⁾

<i>General information:</i>		<small>Fact sheets are updated biannually; May and September</small>					
Capital:	Singapore	Head of State:					
Surface area:	1 thousand sq km	President HE Mr S R Nathan					
Official languages:	Malay; Chinese (Mandarin); Tamil; English	Head of Government:					
Population:	4.6 million (2007)	Prime Minister HE Mr Lee Hsien Loong					
Exchange rate:	AS1 = S\$1.2882 (Feb 2008)						
<i>Recent economic indicators:</i>		2003	2004	2005	2006	2007(a)	2008(b)
GDP (US\$bn) (current prices):		93.2	109.2	119.8	136.6	161.3	165.3
GDP PPP (US\$bn) (c):		148.1	166.6	184.9	206.3	228.1	242.0
GDP per capita (US\$):		22,638	26,199	28,081	31,028	35,163	39,681
GDP per capita PPP (US\$) (c):		35,996	39,994	43,333	46,863	49,714	51,829
Real GDP growth (% change YOY):		3.5	9.0	7.3	8.2	7.7	4.0
Current account balance (US\$m):		21,589	18,235	22,276	29,765	39,157	38,074
Current account balance (% GDP):		23.2	16.7	18.6	21.8	24.3	20.6
Goods & services exports (% GDP):		212.6	227.0	237.8	244.6	230.9	230.7
Inflation (% change YOY):		0.5	1.7	0.5	1.0	2.1	4.7

With the significant impact of globalization, outsourcing and IT application on the global

2. Methodology for analysis

This paper can use the AHP(Analytical Hierarchy Process) or the ANP(Analytic Network Process) model to calculate the weights of tangible and intangible criteria for ranking the priority of developing the strategy and overcoming the weakness. ANP is a more general form of the AHP. ANP allows for more complex interrelationships among the decision level and attributes(criteria), while

2) The global competitiveness, 2007-2008

3) Working Group on Logistics (2002) Developing Singapore into a Global Integrated Logistics Hub, September IE Singapore, 2002

AHP uses a unidirectional hierarchical relationship among decision level. This paper used the AHP model to show which factors will be developed or be complement.

II . ANALYSIS

This paper refers to the data from carried out over the period October 2003 to May 2004 by Maritime Research Centre(MRC) and Maritime Logistics Centre(MLC). Total of 73 organizations comprising 3PLs and manufacturers with internal logistics function were surveyed. The main survey of 48 companies by the MRC represented about 12% of over 400 companies approached. A follow-up survey of 25 companies was executed using the questionnaire that was explained and completed either through face-to-face interviews or through telephone conversations with the participants. The overall sample of 70 companies covered a wide range of company sized and included several key players. Both local and multi-national companies were represented.

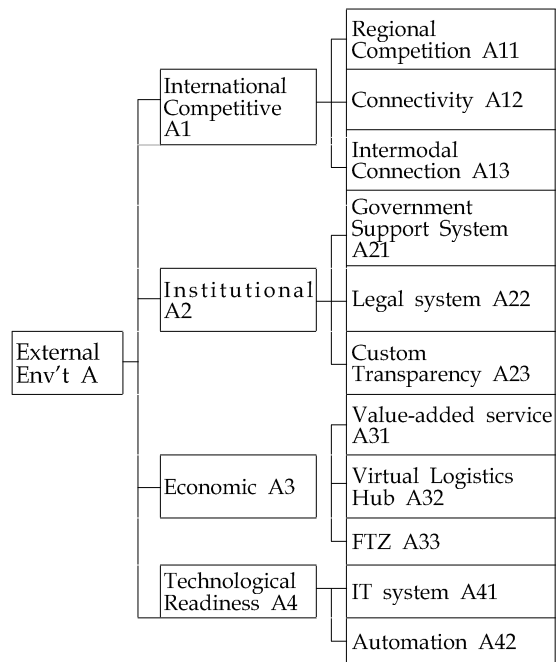
1. External environment factors

In this part, I choose 4 factors including factors of international competitive, institutional, economic, and technological readiness factors.

1.1 Evaluation of factors

1) Establishment of hierarchical structure model of the external environment factors

According to the above analysis, system evaluation model of external environment factors will be established as Fig.1.



[Fig. 1] Evaluation model of External Factors

2) Establishment of matrix, calculation of weight and ranking of level

The weights are calculated by root method, which means by using the geometric mean of each row in pair wise comparison matrix. The weights are as the following tables:

<Table 2> Table of defining judgment criterion⁴⁾

Definition: Comparison of P_i and P_j	Judgment criterion
P_i and P_j are of equal importance	1
P_i is weakly more important than P_j	3
P_i is strongly more important than P_j	5
P_i is very strongly more important than P_j	7
P_i is absolutely more important than P_j	9
Intermediate values	2, 4, 6, 8,
Opposite situation : The reciprocal of the corresponding above numbers	

4) Saaty, T.L. (1980), the Analytic Hierarchy Process: Planning, Priority Setting, Resource Allocation: Mc Graw-Hill

<Table 3> Relative importance of A as compared with A1, A2, A3, and A4

A	A1	A2	A3	A4	Wi
A1	1	3	4	1/2	0.311
A2	1/3	1	1/2	1/4	0.087
A3	1/4	2	1	1/5	0.109
A4	2	4	5	1	0.492

<Table 4> Relative importance of A1 as compared with A11, A12, and A13

A1	A11	A12	A13	Wij
A11	1	2	5	0.562
A12	1/2	1	5	0.351
A13	1/5	1/5	1	0.086

<Table 5> Relative importance of A2 as compared with A21, A22, and A23

A2	A21	A22	A23	Wij
A21	1	1	1/4	0.160
A22	1	1	1/5	0.149
A23	4	5	1	0.691

<Table 6> Relative importance of A3 as compared with A31, A32, and A33

A3	A31	A32	A33	Wij
A31	1	3	1/7	0.146
A32	1/3	1	1/9	0.063
A33	7	9	1	0.791

<Table 7> Relative importance of A4 as compared with A41 and A42

A4	A41	A42	Wij
A41	1	3	0.750
A42	1/3	1	0.250

<Table 8> Relative weight of Ai as compared with Aij

Objec-tive	Relative weight	Objec-tive	Relative weight	Relative weight of Ai as compared with Aij
A1	0.311	A11	0.551	0.171
		A12	0.364	0.113
		A13	0.085	0.026
A2	0.087	A21	0.160	0.014
		A22	0.149	0.013
		A23	0.691	0.060
A3	0.109	A31	0.146	0.016
		A32	0.063	0.007
		A33	0.791	0.086
A4	0.492	A41	0.750	0.369
		A42	0.250	0.123

3) The consistency test

<Table 9> Consistency values¹⁾ (RI)

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.52	0.89	1.11	1.25	1.36	1.40	1.45	1.49

The relative weight of A as compared with

$$A = (A_1, A_2, A_3, A_4)^T \text{ would be:}$$

$$W_A = (W_{A_1}, W_{A_2}, W_{A_3}, W_{A_4})^T = (0.311, 0.087, 0.109, 0.492)^T$$

The next step is to compute the maximum Eigen value and perform consistency's test.

$$A_{-A}W_A = \begin{bmatrix} 1 & 3 & 4 & 1/2 \\ 1/3 & 1 & 1/2 & 1/4 \\ 1/4 & 2 & 1 & 1/5 \\ 2 & 4 & 5 & 1 \end{bmatrix} \begin{bmatrix} 0.311 \\ 0.087 \\ 0.109 \\ 0.492 \end{bmatrix} = \begin{bmatrix} 1.254 \\ 0.368 \\ 0.459 \\ 2.007 \end{bmatrix}$$

$$\lambda_{\max} = \sum_{i=1}^n \frac{(A_{-A}W_A)_i}{n \cdot W_{A_i}} = 4$$

$$CI = \frac{\lambda_{\max} - n}{n - 1} = 0.0463$$

According to the table 9. the value of RI would be:

5) Ding Yizhong, Management science, Qinghua University publishing company,2003

$$RI = 0.89$$

$$CR = \frac{CI}{RI} = 0.052 < 0.1$$

As above calculation, the consistency of matrix is acceptable.

1.2 Choosing and analysis of O, T from external environment factor system

In this part, I make reference to importance scores of singapore logistics industry which are given by survey. Then, I combine the importance values, table 10, with the weights by using the Delphi method and gained the compositive weights of external environment factors.

<Table 10> Importance values of Singapore Logistics Industry

Score	Importance
-5	Not at all important
-3	Somewhat important
0	Fairly important
3	Very important
5	Critical

There are 11 external environment factors of Singapore Logistics Industry. According to expert advices, the factor of which the compositive weight is less than 0.100 is secondary influence factor. There are 6 secondary influence factors and they are debarred. The rest factors are major influence factors.

<Table 11> Evaluation of external environment factors

External environment	Weight	Importance score	Compositive weight
Regional Competition	0.171	3	0.513
Connectivity	0.113	3	0.339
Intermodal Connection	0.026	-3	-0.078
Government Support Schemes	0.014	-3	-0.042
Legal System	0.013	-3	-0.039
Customs Transparency	0.060	0	0
Value-added Service	0.016	-3	-0.048
Virtual Logistics Hub	0.007	5	0.035
FTZ	0.086	-5	-0.43
IT system	0.369	0	0
Automation	0.123	3	0.369

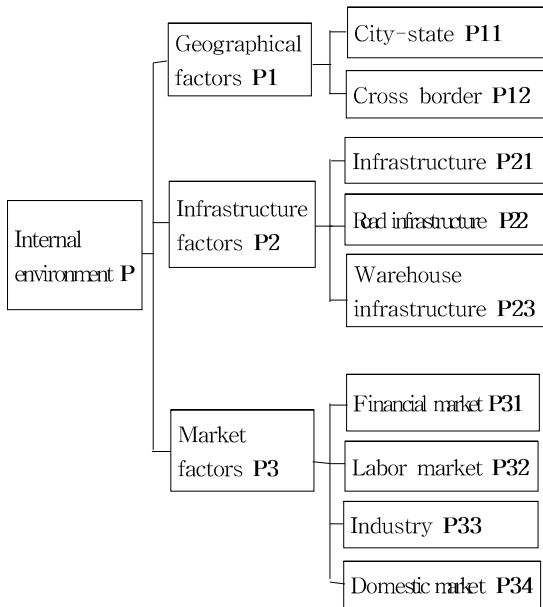
2. Internal environment factors

In this part, I choose 4 factors including factors geographical, infrastructure, and market factors.

2.1 Evaluation of the internal environment factors

1) Establishment of hierarchical structure model of the internal environment factors.

According to the above analysis, system evaluation model of internal environment factors will be established as above.



[Fig. 2] Evaluation model of Internal Environmental factors

2) Establishment of matrix, calculation of weight and ranking of level

The weights are calculated by normalizing the geometric mean of each row in pair wise comparison matrix. The weights are as the following tables:

<Table 12> Relative importance of P as compared with P1, P2, and P3

P	P1	P2	P3	Wi
P1	1	1/5	1/2	0.122
P2	5	1	3	0.649
P3	2	1/3	1	0.230

<Table 13> Relative importance of P1 as compared with P11 and P12

P1	P11	P12	Wij
P11	1	1	0.500
P12	1	1	0.500

<Table 14> Relative importance of P2 as compared with P21, P22, and P23

P2	P21	P22	P23	Wij
P21	1	3	5	0.649
P22	1/3	1	2	0.230
P23	1/5	1/2	1	0.122

<Table 15> Relative importance of P3 as compared with P31, P32, P33, and P34

P3	P31	P32	P33	P34	Wij
P31	1	3	9	5	0.563
P32	1/3	1	7	3	0.274
P33	1/9	1/7	1	1/6	0.035
P34	1/5	1/3	6	1	0.129

3) The consistency test

<Table 16> Relative weight of Pi as compared with Pij

Objective	Relative weight	Objective	Relative weight	Relative weight of Pi as compared with Pij
P1	0.122	P11	0.500	0.061
		P12	0.500	0.061
P2	0.649	P21	0.649	0.421
		P22	0.230	0.149
		P23	0.122	0.079
P3	0.230	P31	0.563	0.129
		P32	0.274	0.063
		P33	0.035	0.008
		P34	0.129	0.030

The relative weight of P as compared with $P = (P1, P2, P3)^T$ would be:

$$W_P = (W_{P1}, W_{P2}, W_{P3})^T = (0.122, 0.649, 0.230)^T$$

The next step is to compute the maximum Eigen value and perform consistency's test.

$$CI = \frac{\lambda_{max} - n}{n - 1} = 0.0018$$

According to the table 9, the value of RI

would be:

$$RI = 0.52$$

$$CR = \frac{CI}{RI} = 0.003 < 0.1$$

As above calculation, the consistency of matrix is acceptable.

2.2 Choosing and analysis of S, W from internal environment factor system

In this part, I also refer to importance score of singapore logistics industry from the survey. Then, I combine the importance values with the weights and gained the compositive weights of internal environment factors.

There are 9 internal condition factors of Singapore Logistics Industry. According to expert advices, there are 3 secondary influence factors and they are debarred. The rest factors are major influence factors. They are:

P21 (2.105), P22 (0.447), P31 (0.388) are chosen to be S (Strength).

P11 (-0.183), P12 (-0.183), P34 (-0.089) are chosen to be W (Weakness).

<Table 17> Evaluation of internal environment factors

Internal environment factors	Weight	Importance score	Compositive Weight
City-State	0.061	-3	-0.183
Cross-border	0.061	-3	-0.183
Infrastructure	0.421	5	2.105
Road Infrastructure	0.149	3	0.447
Warehouse Infrastructure	0.079	0	0.000
Financial Market	0.129	3	0.388
Labor Market	0.063	0	0
Industry	0.008	-5	-0.040
Domestic Market	0.030	-3	-0.089

III. CONCLUSION

This paper is applied SWOT analysis to figure out the conclusion. SWOT analysis is a strategic planning method used to evaluate the strengths, weaknesses, opportunities, and threats involved in researches. It involves specifying the objective of the research and identifying the internal and external factors that are favorable and unfavorable to achieving that objective. According to the factors of the opportunity, threat, strength and weakness, first of all, Singapore needs to keep good partnership with surrounding countries. Co-operation and win-win alliances among the major seaport and airports in the region should be explored to make the region more competitive and attractive for foreign manufacturing and logistics firms. Singapore should build the multi-modal hub which has physical and IT infrastructure to ensure a seamless flow of goods among the various modes to leverage the peripheral countries. Also, this strategy will be complemented the weakness of Singapore which does not have enough hinterland.

Secondly, they need to establish the global integrated logistics hub. The growing global competition and complex logistics environment are posing fresh challenges and opportunities for Singapore. The increase in outsourcing trends, demand for total logistic support and need for cost reduction necessitate the establishment of both a strong logistics infrastructure and excellent logistics management skills. Singapore is already at the forefront of this development and is strengthening its position by focusing on developing integrated logistics capabilities,

technological expertise and manpower skills.

Thirdly, they need to develop the liberalizing trade. To make a freer trading and investment environment, Singapore should be more outward-looking and welcoming to foreign investors by liberalizing markets, improving customs clearance and treating foreign and large businesses on the same footing as local small and medium-size firms(SMEs).

Finally, they need to develop the knowledge intensive and high value-added activities. While joint technology enhancement, especially in the area of information technology, is important to improve their level of competitiveness. Utilizing the peripheral countries as outsourcing, globalization, and hinterland, Singapore should focus on knowledge intensive and high value added activities.

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