

KSF for Operation Headquarters Positioning in Global Logistics Management -- Taiwan's Perspective

Sheng-Jie J. Hsu^{1*}, Chun-Wei R. Lin², Min-Ya Tseng³

^{1*} *Department of Information Management, Transworld University
1221, Zhen-Nan Road, Douliu, Yunlin, Taiwan, 64005, R.O.C.
jess@twu.edu.tw*

² *Department of Industrial Engineering and Management, National Yunlin University of Science and Technology
123, University Road Section 3, Douliou, Yunlin, Taiwan, 640, R.O.C.
lincwr@yuntech.edu.tw*

³ *Department of Marketing Management, Transworld University
1221, Zhen-Nan Road, Douliu, Yunlin, Taiwan, 64005, R.O.C.
minya@twu.edu.tw*

Abstract

Operation Headquarters (OHQ) positioning is an important decision in enterprise's Global Logistics Management (GLM). This article applied the Fuzzy Analytic Hierarchy Process (FAHP) to extract the Key Successful Factors (KSFs) for enterprise's OHQ positioning. Finally, this article suggested five KSFs as: 1. Market Development Ability, 2. Product Development Ability, 3. Response Ability, 4. Financial Risk Management Ability, and 5. Production Ability.

Keywords -- Operation Headquarters, Global Logistics Management, Key Successful Factor, Fuzzy Analytic Hierarchy Process.

1. INTRODUCTION

Many organizations have a significant and growing presence in resource and/ or demand markets outside their country of origin. Current business conditions blur the distinctions between domestic and international logistics. Successful enterprises have realized that to survive and prosper they must go beyond the strategies, policies, and programs of the past and adopt a global view of business, customers, and competition. [Stock and Lambert, 2001] Therefore, enterprise extends its operation to the global and become a Multi-National Enterprise (MNE). And its logistics system must to match up its enterprise strategy, to be a global logistics

system. For MNE, Operation Headquarters (OHQ) positioning is an important decision in its Global Logistics Management (GLM).

In Robinson's opinion [1984], Operation Headquarters is an international integrated production system for enterprise transfer to overseas production place, and owns ownership and management authorities in the host country. In Taiwan, the Council for Economic Planning and Development (CEPD) explained Operation Headquarters as: Operation Headquarters is the decision center and value-creative base for the enterprise to precede its operation functions such as: R&D, production, marketing, finance, logistics support, and so on¹.

This article tried to extract the Key Successful Factors (KSFs) for the selection in MNE's OHQ. And this article applied the Fuzzy Analytic Hierarchy Process (FAHP) method to accomplish this study. The corresponsive importance among the KSF raised was clarified via the cautious professional questionnaire joined with a solid data analysis and FAHP ranking.

The issue of KSF was first proposed by Daniel [1961] who mentioned that most of the successful enterprises possess three to six fundamental elements. A company who was desirous to be successful was required to be excellent in those essentialities.

2. QUESTIONNAIRE DESIGN

¹ <http://www.cepd.gov.tw/encontent/m1.aspx?sNo=0001274>,
reference date: 2011/1/3.

Refer to the FAHP's methodology, the questionnaire was designed as 4 levels hierarchy including 2 dimensions and 43 variables. The structure showed as Fig. 1, and brief described in the next sub-sections.

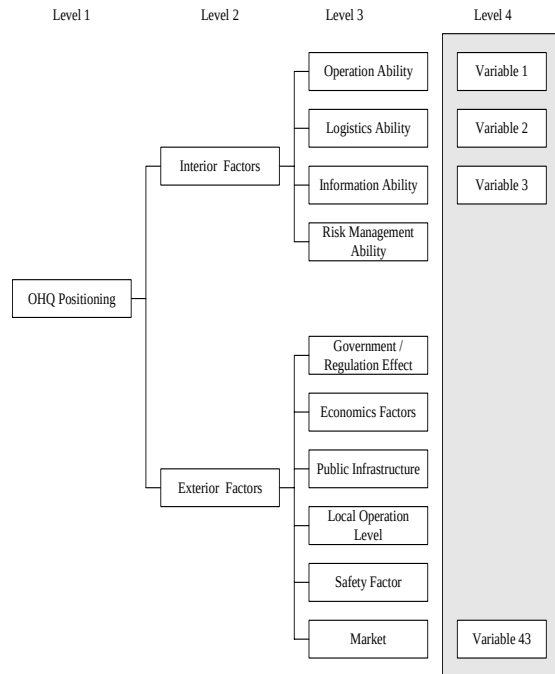


Fig. 1 the questionnaire structure

2.1. Level 2 Description

The Level 2 dimension including 2 items: Interior Factors and Exterior Factors. The description is show as TABLE 1.

TABLE 1
Level 2 Dimension Description

Item	Definition
Interior Factors	means the distinctive abilities for the enterprise
Exterior Factors	means the exterior factors that must face for enterprise operation

2.2. Level 3-1 Description

The Level 3-1 was the sub-dimension for the "Interior Factors" which includes 4 items: Operation Ability, Logistics Ability, Information Ability, and Risk Management Ability. The description is show as TABLE 2.

TABLE 2
Level 3-1 Dimension Description

Dimension	Variable	Literature
Operation Ability	Product Development Ability	Hill [2006]

Dimension	Variable	Literature
	Production Ability	Simchi-Levi et al. [2000]
	Market Development Ability	Flint [2004]
	Human Resource	Stock and Lambert [2001]
	Response Ability	Chopra and Meindl [2007]
Logistics Ability	Supplier Stability	Handfield and Nichols [2005]
	Dealers/ Agents Stability	Handfield and Nichols [2005]
	Inventory Visibility	Bowersox et al. [2002]
	Distribution Ability	Handfield and Nichols [2005]
	Green Logistics Ability	Dornier et al. [1998]
Information Ability	Electronicalizational Level	Turban et al. [2000]
	Information System Integration Degree	Simchi-Levi et al. [2000]
	Information System Implementation Degree	Copper and Zumd [1990]
Risk Management Ability	Financial Risk Management Ability	Frazelle [2002]
	Operational Risk Management Ability	Bowersox et al. [2002]

2.3. Level 3-2 Description

The Level 3-2 was the sub-dimension for the "Exterior Factors" which includes 6 items: Government / Regulations Effect, Economic Factors, Public Infrastructures, Local Operation Level, Safety Factor, and Market. The description is show as TABLE 3.

TABLE 3
Level 3-2 Dimension Description

Dimension	Variable	Literature
Government/ Regulations Effect	Government Efficiency	²
	Home Country Policy	³
	Host Country Policy	⁴
	Government Stability	⁵
	Legal Advanced Degree	Hill [2006]
Economic	Exchange Rate	Stock and

² <http://www.imd.ch/research/centers/wcc/index.cfm>, reference date:2009/3/20.

³ <http://tw.news.yahoo.com/article/url/d/a/091219/17/1x8q0.html>, reference date: 2009/12/19.

⁴ http://tw.stock.yahoo.com/news_content/url/d/a/091217/3/1tbbn.html, reference date: 2009/12/17.

⁵ <http://tw.news.yahoo.com/article/url/d/a/081127/78/1a5t5.html>, reference date: 2008/11/27.

Dimension	Variable	Literature
Factors	Stability	Lambert [2001]
	Interest Rate Stability	⁶
	Economic Growth Rate	Stock and Lambert [2001]
	Foreign Exchange Reserves	⁷ ⁸
	Exporting Amount	Hill [2006]
	Importing Amount	
	Taxation Level	Hill [2006]
	Incentive Measures	⁹
Public Infrastructures	Land Acquirability	
	Harbor Container Throughput	¹⁰ ¹¹
	Customhouse Efficiency	Simchi-Levi et al. [2000]
	Harbor Facility Perfect Degree	
	Infrastructure Index	¹²
Local Operation Level	Laborer Quality	Cullen and Parboteeah [2005]
	National Incomes	Hill [2006]
	Business Efficiency	¹³
Safety Factor	National Safety Degree	¹⁴
	Geographical Safety Degree	¹⁵ ¹⁶

Dimension	Variable	Literature
Market	Market population	¹⁷ ¹⁸ ¹⁹
	Market land area	Dornier et al. [1998]
	Market Acceptance Degree	Cullen and Parboteeah [2005]
	Market Competitive Degree	Porter [1985]
	Globalization Index	²⁰

3. DATA ANALYSIS

3.1. Sample Description

This article proposed the FAHP's questionnaire by chosen 14 experts from many MNE. These experts includes 2 R&D managers, 2 financial managers, 2 accounting managers, 1 production manager, 2 marketing managers, 1 risk manager, 2 trade managers, 1 personnel manager, and 1 information manager.

3.2. The Computation Technology for FAHP

This article applied FAHP method to compute the index numbers for KSF.

According to the AHP level structure design, the questionnaire used in this study was generalized into four levels: the goal, the dimensions, the sub- dimensions and the criteria. Every factor belonging to different levels was evaluated by the expert scholars, and the results were regarded as the reference of KSF.

Based on the AHP analysis, the variables were compared in pairs. The relative importance between two variables, from low to high, hence was ranked into five ranks: the number (1) for equal important, (3) for slightly important, (5) for very important, (7) for extremely important, and (9) for absolutely important. And, there are rank (2), (4), (6), and (8) in between each ranks accordingly.

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<http://tw.news.yahoo.com/article/url/d/a/100108/5/1yfbw.html>, reference date: 2010/1/8.

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<http://tw.news.yahoo.com/article/url/d/a/090203/1/1duhl.html>, reference date: 2009/2/3.

⁸

<http://tw.news.yahoo.com/article/url/d/a/090904/52/1qhcw.html>, reference date: 2009/9/4.

⁹

http://www.cciconline.net/ccics/images/news/20030617_2.doc, reference date: 2003/6/17.

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<http://tw.news.yahoo.com/article/url/d/a/100126/5/1zh4h.html>, reference date: 2010/1/26.

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<http://tw.news.yahoo.com/article/url/d/a/100125/5/1ze3h.html>, reference date: 2010/1/25.

¹²

<http://www.imd.ch/research/centers/wcc/index.cfm>, reference date: 2009/3/20.

¹³

<http://www.imd.ch/research/centers/wcc/index.cfm>, reference date: 2009/3/20.

¹⁴

<http://tw.news.yahoo.com/article/url/d/a/091104/78/1ua0s.html>, reference date: 2009/11/4.

¹⁵

http://en.wikipedia.org/wiki/2004_Indian_Ocean_earthquake, reference date: 2010/1/13.

¹⁶

There were five scientists presented a paper during the 18th Caribbean Geological Conference in March 2008 in Santo Domingo, Dominican Republic, warned of Haiti earthquake risk.
<http://www.cnn.com/2010/TECH/science/01/12/caribbean.earthquakes/index.html>, reference date: 2010/1/13. This

shows sometimes such calamity can be warned for enterprise's operation.

¹⁷

http://en.wikipedia.org/wiki/ASEAN%E2%80%93China_Free_Trade_Area, reference date: 2010/1/11.

¹⁸

http://en.wikipedia.org/wiki/European_Union, reference date: 2010/1/11.

¹⁹

<http://en.wikipedia.org/wiki/NAFTA>, reference date: 2010/1/11.

²⁰

<http://www.kof.ethz.ch>, reference date: 2009/3/20.

The methodology applied the FAHP. Based on the notion of fuzzy sets, instead of crisp value, the interval value was provided for filling the questionnaires in the pair comparison.

The FAHP method is developed as following steps:

Step 1: Construct the analysis levels, including the dimensions and variables in the Fig 1, there are four levels in the FAHP construction.

Step 2: Build the triangular fuzzy number for each variable, denoted by $\tilde{A}=(a, b, c)$ which a is the minimum value among all testee, b is the average value, and c is the maximum value.

Step 3: Build the Pair-Wise Compare Matrix for each levels.

The results of pair-wise compare are stored in a matrix. Such matrix is called the Pair-Wise Compare Matrix, as formula (1):

$$A = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1m} \\ 1/a_{12} & 1 & \cdots & a_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ 1/a_{1m} & 1/a_{2m} & \cdots & 1 \end{bmatrix} \quad (1)$$

Step 4: Consistency Test.

In order to evaluate the decision-maker to judge whether consistent, must make the Consistency Test to the Pair-Wise Compare Matrix. There are two indexes for the Consistency Test: C.I. (Consistency Index) and C.R. (Consistency Ratio), and individual mention as follow:

$$C.I. = \frac{\lambda_{\max} - m}{m - 1} \quad (2)$$

$\forall \lambda_{\max}$ = the maximum eigenvalue
 m = number of decision factors

If C.I.=0, it means the full- consistency. And Saaty [1980] is suggested that $C.I. \leq 0.1$ are allowable deviation range.

$$C.R. = \frac{C.I.}{R.I.} \quad (3)$$

$\forall R.I.$ =Random Index

Saaty [1980] also suggested that the $C.R. \leq 0.1$, and is represented deviation range for the weight judgment in the Pair-Wise Compare Matrix is allowable, that is, it conform the consistency.

Step 5: Compute the Weights for each levels.

After the computation for each level's weight values, then compute the whole hierarchy's weight value. It is computed by multiplication of each level's weight values.

In the computation processes, this article applied the Fuzzy Expected Value (FEV) method for de-fuzzification. For a triangular fuzzy number $\tilde{A}=(a, b, c)$, the FEV is as formula (4) [Heilpern, 1992]:

$$FEV(\tilde{A}) = \frac{1}{4}(a + 2b + c) \quad (4)$$

3.3. Computations

The Consistency Test is showed as TABLE 4. And the weight values for Level 3 are computed as TABLE 5. And the final FAHP values for the whole hierarchy are computed as TABLE 6.

TABLE 4
The Consistency Test

Level	Dimension	The Consistency Test
2	OHQ Positioning	C.I.=0 C.R.=0
3	Interior Factors	C.I.=0.0838 C.R.=0.0931
	Exterior Factors	C.I.=0.0219 C.R.=0.0177
4	Operation Ability	C.I.=0.0339 C.R.=0.0302
	Logistics Ability	C.I.=0.0447 C.R.=0.0399
	Information Ability	C.I.=0.0028 C.R.=0.0047
	Risk Management Ability	C.I.=0 C.R.=0
	Government / Regulations Effect	C.I.=0.0164 C.R.=0.0146
	Economic Factors	C.I.=0.0233 C.R.=0.0165
	Public Infrastructures	C.I.=0.0162 C.R.=0.0145
	Local Operation Level	C.I.=0.0161 C.R.=0.0277
	Safety Factor	C.I.= -0.6838 C.R.=0
	Market	C.I.=0.0184 C.R.=0.164

TABLE 5
The weight values for Level 3

Level 3 Dimension	Weight	Ranking
Operation Ability	0.4574	1
Government / Regulations Effect	0.2578	2
Logistics Ability	0.2568	3
Economic Factors	0.2200	4
Risk Management Ability	0.1606	5
Market	0.1407	6
Information Ability	0.1401	7
Public Infrastructures	0.1367	8
Safety Factor	0.1278	9
Local Operation Level	0.1253	10

TABLE 6
The final FAHP values

Level 4 Variables	Weight	FAHP	Ranking
Market Development Ability	0.2579	0.0940	1
Product Development Ability	0.2285	0.0833	2
Response Ability	0.2059	0.0750	3
Financial Risk Management Ability	0.5632	0.0721	4
Production Ability	0.1803	0.0657	5
Human Resource	0.1769	0.0645	6
Information System Integration Degree	0.5552	0.0620	7
Operational Risk Management Ability	0.4475	0.0573	8
Distribution Ability	0.2782	0.0569	9
Supplier Stability	0.2674	0.0547	10

Note: TABLE 6 only listed the first 10 variables.

4. CONCLUSIONS

As the TABLE 4 shown, all the C.I. value and the C.R. value are small than 0.1. By Saaty's suggestion [1980], the questionnaire conform the consistency.

TABLE 5 appeals that the Operation Ability is the most important dimension for the OHQ's decision, and the following four factors are Government/ Regulations Effect, then Logistics Ability, Economic Factors, and Risk Management Ability.

Finally, as the computed results in TABLE 6, this article suggests five KSF for OHQ in GLM as: 1. Market Development Ability, 2. Product Development Ability, 3. Response Ability, 4. Financial Risk Management Ability, and 5. Production Ability.

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