Method for Comprehensive Evaluation of Enterprise Core Competence and its Application

METHODES POUR L'EVALUATION COMPLETE SUR LA COMPETENCE DISTINCTIVE DE L' ENTREPRISE ET SES APPLICATIONS

LI Qingdong[1]

Abstract: Enterprise core competence is the key for its success. It is important for the investors and management to know the enterprise core competence. In this paper, the indexes and evaluation method for enterprise core competence is discussed. The core competence of China Petrochemical Company (SINOPEC) is evaluated with the model.
Key words: Enterprise core competence; Evaluation method; Fuzzy application

Résumé: Le compétence distinctive de l'entreprise est l'élément important pour sa réussite. C'est important pour les investisseurs et les managers de connaître les compétences distinctives de l'entreprise. Dans cet article, des indices et des méthodes d'évaluation sur les compétences distinctives de l'entreprise ont été étudiés. Les compétences distinctives de la Compagnie pétrochimique de la Chine (SINOPEC) ont été évaluées avec cette méthode.
Mots-Clés: compétence distinctive de l'entreprise; méthode d'évaluation; application floue

1. INTRODUCTION

Many researchers are concerned why some enterprises are successful, while others are not. It is difficult to explain their success or failure merely by factors like their particular industry, ownership, organization structure, scale of production or the endeavor of the management and employees.

In 1990, C. K. Prahalad and G. Hamethe first bring up the concept of "core competence " in their

[1] School of Business and Economics, Liaoning University of Petroleum & Chemical Technology, Fushun Liaoning P. R. China 113001
Vice-professor, Liaoning University of Petroleum & Chemical Technology, Fushun Liaoning, 113001, China.
Ph.D. of JiLin University.
E-mail: liqingdong@163.com
* Received 20 February 2009; accepted 9 February 2009

popular book "Harvard Business Discussion". They explain the performance of enterprises with the perspective of enterprises core competence. In this paper, the evaluation method for the core competence of enterprises is discussed.

2. ENTERPRISE CORE COMPETENCE AND ITS CHARACTERISTICS

There are many kinds of definitions of enterprise core competence. To put it simply, enterprise core competence is the unique ability of an enterprise in product development, technical innovation and marketing. It can affect the other abilities of an enterprise. C. K. Prahalad and G. Hamethe define core competence as "harmonious combination of a set of advanced techniques". The techniques referred here are broad. They include various technical abilities, management strength, organizational structure and marketing. The core competence is an intrinsic behavior of the system. The enterprise core competence is formed in the process of market competition. It cannot be borrowed from outside. The enterprise core competence is a decisive factor for the sustainable development of an enterprise. Core competence has certain characteristics: being of value, unique, difficult to mimic, ductility, accumulative, integrated and dynamic.

3. INDEXES FOR ENTERPRISE CORE COMPETENCE EVALUATION

3.1 Ability of enterprise strategic management (A)

It reflects the adaptability of enterprises to the changes of environment, and the ability to make long-term development strategy of enterprises according to the characteristic and various regulation of environment. The indexes include:

A_1 -- Support and participation of top management in enterprise innovational activities. It is an indicator of whether someone in the top management or specialized department is involved in technical activity or the effectiveness of the long-term strategy.

A_2 -- Integration of enterprise management strategy and technical strategy. It primarily considers relative integration of enterprise technical strategy and management strategy and the role of technical department in the making of long-term development strategy.

A_3 – Top management's awareness of strategic management

A_4 – Ability in marketing. It includes adaptability to market change, forecasting and marketing.

A_5 – Flexibility in strategic management. It is the ability of an enterprise to make strategic changes with the changing environment.

3.2 Enterprise core technical ability (B)

The indexes includes:
B_1 -- Technical level of leading products
B_2 -- Possession of patents
B_3 -- Technical level of equipments
B_4 -- Ratio of employees with higher education or technical post.

3.3 Profit earning ability of the enterprise (C)

The indexes include:
C_1 – Total profits of enterprise
C_2 -- Profit to total asset ratio
C_3 -- Profit to net asset ratio
C_4 -- Profit to income ratio in the main business.

3.4 The ability of organizing and management (D)

The indexes include:
D_1 -- Teamwork of the top management and employee's loyalty to the enterprise.
D_2-- Enterprise culture. Enterprise culture is related with employee's value and behavior.
D_3-- Decision making procedure in investment.
D_4-- Financial management ability
D_5-- Cost management ability
D_6 -- Relationship with stakeholders such as the suppliers, customers etc

3.5 Competition ability (E)

The competition ability is related with marketing process, sales network and controlling and managing of sales channel. The indexes include:
E_1 – marketing force and the strength of the marketing department
E_2 -- Ability of management in controlling of sales channels
E_3 -- After-sales service and customer relationship
E_4 -- Percentage of the number of the sales force to the total number of employees and the average time from new product development to its putting into market
E_5 -- Market share of leading products

3.6 Techniques innovation ability (F)

The indexes include:
F_1 -- The average worth of fixed production assets per worker
F_2 --The advanced degree of equipments
F_3 – Ratio of export to the total sales
F_4 – Ratio of technical innovation to sales
F_5 -- Ratio of technicians to the total of employee

3.7 Environment protection ability (G)

The indexes include:
G_1 -- The endeavor of top management
G_2 -- The facilities for environment protection
G_3 -- The ratio of environmental protection expenses to the total cost
G_4 -- If enterprise takes sustainable development as one of the important strategy

3.8 Human resource development ability (H)

The indexes include:
H_1 -- The productivity of employees. It is the sales in report period per employee.
H_2 -- The increase of employee training expenses to that at the base year.
H_3 -- The ratio of employees left to the total number of employees.
H_4 --Employee competition ability. It is about management' strategic thinking, technician's technical innovation ability and workers' ability to apply the technology.

3.9 Ability in information technology (k)

The indexes include
K_1 – Development of Enterprise Resources Planning (ERP) and its application
K_2 -- The ratio of sales with e-commerce to the total sales
K_3-- The ratio of purchase of supplies with e-commerce to the total purchase.
K_4 -- The development of information management system in enterprises.
K_5 -- Market information collecting ability.

4. FUZZY COMPREHENSIVE EVALUATION ON ENTERPRISE CORE COMPETENCE

4.1 Establishing concourse of evaluation factors

Concourse of evaluation factors are as following.
$O=\{A, B, C, D, E, F, G, H, K\}$
$A=\{A_1, A_2, \ldots, A_i, \ldots, A_m\}$
$B=\{B_1, B_2, B_3, B_4\}$, etc.

4.2 Establishing concourse of weight

The weight of each of the factors is calculated with Analytic Hierarchy Process (AHP)
$W_O=[o_1,o_2,o_3,o_4,o_5,o_6,o_7,o_8,o_9]$, $W_A=[a_1, a_2, a_3, a_4, a_5]$, $W_B=[b_1,b_2,b_3,b_4]$……

4.3 Establishing concourse of comment

Comment is qualitative description on good or bad of evaluation object. It becomes nonfigurative data to evaluation language that people know well. Concourse of comment is consistent to each layer index. P={very good, good, general, bad, badly}.

4.4 Establishing evaluation matrix

Evaluation matrix is fuzzy matrix result from fuzzy mapping. It means a comprehensive result that experts investigate. If there is m index and n grade, then R is m line, n row matrix, namely $R=\{r_{ij}\}$.

4.5 Proceeding to multilevel fuzzy comprehensive evaluation

Beginning from the top level, proceeding to comprehensive evaluation to each layer every kind of index, $E_i=W_i*R_i$.

4.6 Calculating comprehensive evaluation worth

X=E*F. If $X \geq 9$, then enterprise core competence is very good; If $7 \leq X \leq 9$, then enterprise core competence is between good and very good; If $5 \leq X \leq 7$, then enterprise core competence is between okay and good; If $3 \leq X \leq 5$, then enterprise core competence is between bad and okay; If $1 \leq X \leq 3$, then enterprise core competence is between bad and worse; If $X \leq 1$, then enterprise core competence is worse.

5. EVALUATION OF THE CORE COMPETENCE OF SINOPEC WITH THE MODEL

5.1 Establishing index System of Sinopec core competence

Ten experts from SINOPEC are asked to make judgment according to enterprise's concrete circumstance and related data together with various index, corresponding to concourse of comment P=[very good, good, general, bad, badly]. Concourse of comment power coefficient matrix $F=(9, 7, 5, 3, 1)^T$.

5.2 Resolving the weight of index

The AHP is used to get the weight for each of the factors. The calculation results are as follows,
W_O=[0.044,0.264,0.034,0.165,0.188,0.072,0.029,0.09,0.114]
W_A=[0.3166,0.0922,0.0492,0.4208,0.1212]; W_B=[0.55,0.083,0.118,0.249]
W_C=[0.055,0.13,0.252,0.563]; W_D=[0.064,0.331,0.18,0.219,0.134,0.072]
W_E=[0.058,0.121,0.088,0.477,0.256]; W_F=[0.165,0.119,0.06,0.281,0.375]
W_G=[0.144,0.505,0.264,0.087]; W_H=[0.088,0.482,0.158,0.272]
W_K=[0.145,0.093,0.064,0.441,0.257]

5.3 Proceeding to multilevel fuzzy comprehensive evaluation making use of model of fuzzy comprehensive evaluation

Proceeding judgment according to Sinopec concrete circumstance and related data together with various index, corresponding to concourse of comment P=[very good, good, okay, bad, worse]. Concourse of comment power coefficient matrix $F=(9, 7, 5, 3, 1)^T$. Judgment result as following table 1.

5.3.1 Calculating comprehensive evaluation concourse B_i of rule layer i.

From table we know, fuzzy concourse of rule A is: A=(0.3166,0.0922,0.0492,0.4208,0.1212)

Evaluation matrix $R_1=\begin{bmatrix} 0.1,0.2,0.5,0.2,0 \\ 0.1,0.4,0.4,0.1,0 \\ 0.1,0.4,0.4,0.1,0 \\ 0.2,0.3,0.4,0.1,0 \\ 0.1,0.2,0.4,0.3,0 \end{bmatrix}$

Fuzzy comprehensive evaluation matrix:

$B'_1=W_A * R_1$

The calculation result is:

B'_1 =（0.142，0.27，0.432，0.156，0）

According to above, we can get:

$B'_2= W_B * R_2$=(0.225, 0.245, 0.363, 0.167,0); $B'_3= W_C * R_3$=(0.006, 0.256, 0.344, 0.325, 0.069)

$B'_4= W_D * R_4$=(0.082, 0.249, 0.426, 0.243,0); $B'_5= W_E * R_5$=(0.138, 0.251, 0.283, 0.328, 0)

$B'_6 = W_F * R_6$=(0.063, 0.263, 0.431, 0.243, 0); $B'_7 = W_G * R_7$=(0.065, 0.159, 0.376, 0.4, 0)

$B'_8 = W_H * R_8$=(0.1, 0.216, 0.475, 0.209, 0); $B'_9 = W_K * R_9$=（0.084, 0.255, 0.316, 0.315, 0.03）

Table 1. Table of comment

Rule layer		Index layer		The number of each grade				
Rule	Weight	Index	Weight	9 points	7 points	5 points	3 points	1 point
A	0.044	A_1	0.3166	1	2	5	2	0
		A_2	0.0922	1	4	4	1	0
		A_3	0.0492	1	4	4	1	0
		A_4	0.4208	2	3	4	1	0
		A_5	0.1212	1	2	4	3	0
B	0.264	B_1	0.55	2	2	4	2	0
		B_2	0.083	2	3	4	1	0
		B_3	0.118	2	3	3	2	0
		B_4	0.249	3	3	3	1	0
C	0.034	C_1	0.055	1	2	4	2	1
		C_2	0.13	0	2	4	3	1
		C_3	0.252	0	2	4	2	2
		C_4	0.563	0	3	3	4	0
D	0.165	D_1	0.064	1	3	4	2	0
		D_2	0.331	1	3	4	2	0
		D_3	0.18	0	3	5	2	0
		D_4	0.219	1	1	5	3	0
		D_5	0.134	1	3	3	3	0
		D_6	0.072	1	2	4	3	0
E	0.188	E_1	0.058	1	2	3	4	0
		E_2	0.121	2	2	3	3	0
		E_3	0.088	1	2	4	3	0
		E_4	0.477	1	2	3	4	0
		E_5	0.256	2	4	2	2	0
F	0.072	F_1	0.165	1	3	4	2	0
		F_2	0.119	1	3	4	2	0
		F_3	0.06	1	3	3	3	0
		F_4	0.281	1	3	4	2	0
		F_5	0.375	0	2	5	3	0
G	0.029	G_1	0.144	1	1	4	4	0
		G_2	0.505	1	2	3	4	0
		G_3	0.264	0	1	5	4	0
		G_4	0.087	0	2	4	4	0
H	0.09	H_1	0.088	1	2	4	3	0
		H_2	0.482	1	2	5	2	0
		H_3	0.158	1	3	4	2	0
		H_4	0.272	1	2	5	2	0
K	0.114	K_1	0.145	1	1	3	4	1
		K_2	0.093	0	2	4	3	1
		K_3	0.064	0	2	4	3	1
		K_4	0.441	1	3	3	3	0
		K_5	0.257	1	3	3	3	0

5.3.2 Calculating comprehensive evaluation concourse B of target layer

The weight concourse of target O, W_O=(0.044,0.264,0.034,0.165,0.188,0.072,0.029,0.09,0.114)

B= W_O*R. The calculation result is: B=(0.13,0.246,0.37,0.248,0.006)

5.3.3 Calculating comprehensive evaluation worth

Because of Concourse of comment power coefficient matrix is $F=(9, 7, 5, 3, 1)^T$, comprehensive evaluation worth is: X=B*F

The calculation result is x=5.492

5.4 Simple analysis

Because of $5 \leq X = 5.492 \leq 7$, according to Concourse of comment power coefficient matrix is $F=(9, 7, 5, 3, 1)^T$， and corresponding to concourse of comment P=[very good, good, okay, bad, worse]. Then Sinopec core competence is between okay and good. Sinopec core competence falls into middle level or above according to the result of evaluation, although it has certain competition ability, there is also a great gap between China's petrochemical enterprises and their overseas counterparts.

6. CONCLUSION

Evaluating enterprise core competence can help enterprise top management to know the strengths and weakness of enterprises. It can help the management to find the weakest links in the enterprises, so that the managers can make the best use of their resources and improve their competitiveness in the market.

REFERENCES

CHEN Jianhua. (2002). Breeding and managing of the core competence of enterprise. *Techno-economics & Management*, 1, 88-89. (in Chinese)

LIU Yong and MA Shengjie. (2001). A fundamental thought to create core capacity of enterprise. *Quantitative and Technical Economics*, 5, 123-125. (in Chinese)

WANG Hecheng. (2001). On the evaluation of international competitiveness of enterprise. *Quantitative and Technical Economics*, 1, 111-113. (in Chinese)

WU Yonglin and GAO Hongshen. (2002). The multilevel fuzzy comprehensive evaluation method of company's capabilities of technical innovation. *Quantitative and Technical Economics*, 3, 53-56. (in Chinese)

ZHOU Chunxi. (2002). The fuzzy comprehensive evaluation method of international competitiveness of enterprise. *Quantitative and Technical Economics*, 3, 57~60. (in Chinese)