

On Core Competitiveness Evaluation Model of Power Generating Enterprises Based on Knowledge Management

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Abstract

Based on summing-up current power market environment where power generating enterprises are, this paper elaborates relevant theories to knowledge management and core competitiveness of power generating enterprises. Combining current situation and demand of Chinese power generating enterprises, we construct core competitiveness evaluation index system of power generating enterprises based on knowledge management. Then we use Radar Map and the improved entropy of the Topsis method for reference to establish core competitiveness evaluation model of power generating enterprises. Finally, we systematically elaborate the applicability of core competitiveness rating model of power generating enterprises, and summarize the applicable value and insufficient of the model.

Keywords: Knowledge Management, Power Generating Enterprise, Core Competitiveness

1. Preface

Start with fund-raising power, the diversity of power system has grown up. The reform of power system is being promoted, power market is being established, and a series of power supervision and running rules have been introduced gradually, so power generating enterprises are in a completely new market environment. How to promote core competitiveness in the emerging power market environment is a big question that every power generating enterprise has to face. The purpose of this paper is to combine present situation and demand of Chinese power generating enterprises, in order to construct core competitiveness evaluation index system and model method of power generating enterprises based on knowledge management. Power generating enterprises will find gap through evaluating their and their competitors' competitiveness and comparing index system, so that they can improve competitiveness accordingly.

2. Content of Knowledge Management and Corporate Core Competitiveness

2.1 Knowledge Management

Knowledge management is a new term in management field, however, for its definition; there has been no unitive conclusion yet. At present, there are dozens of definitions on knowledge management. Two typical definitions are as follows.

Verna Allee thinks: "Knowledge management is a kind of technique helping people to consider the knowledge they have, and help, develop and support them for knowledge communication. And it also helps people to achieve knowledge source and to promote knowledge communication with each other." Chinese scholars have proposed their own ideas on the content of knowledge management as well. Jiawei Wu claims: "Information management is the base of knowledge management. And knowledge management is the extension and development of information management. It is different from the previous stages of information management, connecting information with information, information with activity, information with person, which applies team intelligence to innovate and gain competitive advantage through information and knowledge share during interactive process of interpersonal communication."

Knowledge management consists of object, subject, mode of action and tool.

The characteristics of knowledge management are: (1) high cost of effective knowledge management; (2) high attention to talents; (3) game theory; (4) marketability.

2.2 Corporate Core Competitiveness

Corporate core competitiveness could be regarded as knowledge form of how to coordinate using all corporate

resources. For instance, corporate culture could be looked upon as closed knowledge of what to do and how to do it. Corporate core competitiveness is a corporate internal characteristic and unique technique and intelligence accumulated in a long term in a corporation.

The effects of corporate core competitiveness on corporate competitive advantages are mainly represented as: (1) improve corporate market competitive potential; (2) construct corporate competitive advantage; (3) maintain corporate long-term competitive advantage.

3. Construction of Core Competitiveness Evaluation Index System of Power Generating Enterprises based on Knowledge Management

Core competitiveness evaluation index system of power generating enterprises based on knowledge management should entirely represents the comprehensive strength and advantage of power generating enterprises, which determines whether power generating enterprises can be provided with a quantitative and operable base. Literature 3 has constructed comparatively entire core competitiveness evaluation index system of power generating enterprises. Basing on this system, we make improvement. considering current situation and demand of Chinese power generating enterprises, we think core competitiveness evaluation index system of power generating enterprises based on knowledge management should includes four evaluation factors: scale resource strength, system foundation ability, technical management ability and culture knowledge ability. See Table 1

Insert Table 1 Here.

4. Core Competitiveness Two-Evaluation Model of Power Generating Enterprises based on Knowledge Management

There is an evaluation model called Radar Map, see Literature 2. It is a kind of graphic method, which shows evaluation index of object system with planar graph. In order to guarantee the validity of evaluation, herein we suggest using one more evaluation method- the improved entropy of the Topsis method, to test and supplement Radar Map.

4.1 Radar Map

We establish core competitiveness evaluation model of power generating enterprises based on Radar Map, see Figure 1.

Insert Figure 1 Here

Radar Map can not only vividly, obviously, and accurately express the difference and core competitiveness of investigation enterprises, but also calculate all aspects more specifically. Calculation and grading methods are as follows.

(1) The evaluation model circle is divided into 4 regions, i.e. scale resource strength, system foundation ability, technical management ability and culture knowledge ability, which are distributed on respective index volume. The core competitiveness of each region is calculated as follows.

Scale resource strength: $X1=\{X11, X12, X13, X14, X15\}$; $X11=\{X111, X112\}$,

System foundation ability: $X2=\{X21, X22, X23\}$; $X21=\{X211, X212, X213\}$,

Technical management ability: $X3=\{X31, X32, X33\}$; $X31=\{X311, X312, X313, X314, X315, X316\}$,

Culture knowledge ability: $X4=\{X41, X42, X43\}$; $X41=\{X411, X412, X413\}$,

The score of core competitiveness of whole power generating enterprises is: $X=\{X1, X2, X3, X4\}$

(2) Specifically speaking, we can use Mathematical integral method to calculate the area of “scale resource strength, system foundation ability, technical management ability and culture knowledge ability”. The formula is:

$$S = \sum \frac{1}{2} r_i r_{i+1} \sin(\theta_{i+1} - \theta_i)$$

The area of each region is composed of several triangles. The two sides of the triangle are r, r_{i+1} and the angle between the two sides is $\theta_{i+1} - \theta_i$. The area can be considered as evaluated ability of the above four aspects, so that the difference of four sectors' area from that of benchmarking enterprise shows out.

(3) Through area integral, we can figure out the value of basic competitiveness region and of core competitiveness region so as to learn real situation of evaluated enterprise compared to benchmarking enterprise by quantitative analysis.

(4) We can calculate whole area of evaluated enterprise, and then compare it with that of benchmarking enterprise

to see the difference of “core competitiveness”.

4.2 Improved Entropy of the TOPSIS Method

TOPSIS method (distance integration method) is a kind of evaluation method based on space statistics, which determines reference point in a space through transforming statistic data into point of Multi-dimensional coordinates, i.e. ideal value point and negative ideal value point. And then the distance between individual sample point and reference point is figured out for analysis and evaluation. Evaluation steps are as follows.

(1) Assume there are i to-be-evaluated power generating enterprises, and j evaluation index. So original data matrix is $X = x_{i \times j}$.

(2) Choose the optimal value of each evaluation index X_j^* . If j is positive index, the bigger the better; if j is negative index, then the smaller the better.

(3) Define the proximity of X_{ij} to X_j^* , D_{ij} .

$$\frac{x_{ij}}{x_j^*}, x_j^* = \max_{1 \leq i \leq m} \{x_{ij}\} \quad \text{Positive index}$$

$$x_j^* D_{ij} =$$

$$\frac{x_j^*}{x_{ij}}, x_j^* = \max_{1 \leq i \leq m} \{x_{ij}\} \quad \text{Negative index}$$

(4) Normalize D_{ij} .

$$d_{ij} = D_{ij} / \sum_{i=1}^m D_{ij} \quad 0 \leq d_{ij} \leq 1, \sum_{i=1}^m d_{ij} = 1$$

(5) Normalize $H_j = -\sum_{i=1}^m d_{ij} \ln d_{ij}$ with $H_{\max}$ and get entropy value showing the importance of evaluation index.

$$h_j = \frac{H_j}{\ln m}$$

(6) Determine the evaluation weight v_j of evaluation index j with h_j

$$v_j = \frac{1}{n - H} [1 - h_j], j = 1, 2, \dots, n, \text{ herein } H = \sum_{j=1}^n h_j$$

(7) Determine reference sample, including optimal sample Y^+ and worst sample Y^- . Herein:

Optimal sample

$$Y^+ = (y_1^+, y_2^+ \dots y_n^+), y_j^+ = \max_{1 \leq i \leq m} \{y_{ij}\}$$

Worst sample

$$Y^- = (y_1^-, y_2^- \dots y_n^-), y_j^- = \min_{1 \leq i \leq m} \{y_{ij}\}$$

(8) Figure out comparative proximity between sample point and optimal sample point, C_i

$$C_i = \frac{D_i^-}{D_i^+ + D_i^-}, 0 \leq C_i \leq 1$$

D_i^+ is the distance between sample point and optimal sample point; D_i^- is that between sample point and worst sample point.

$$D_i^+ = \sqrt{\sum_{j=1}^n (y_{ij} - y_j^+)^2}, D_i^- = \sqrt{\sum_{j=1}^n (y_{ij} - y_j^-)^2}$$

From the formula of C_i we can see, enterprises with bigger C_i is better than those with smaller C_i . Therefore, we can rank the core competitiveness of different enterprises.

5. Conclusion

Through evaluating core competitiveness of power generating enterprises, we can not only see corporate real situation systematically, but also find out some weakness. The core competitiveness evaluation index system of

power generating enterprises based on knowledge management proposed by this paper is closed to practice and also guarantee the accuracy. Furthermore, we established a two-model, Radar Map and the improved entropy of the Topsis method, which provides power generating enterprises with ideas for promoting core competitiveness. Moreover, a few questions in this paper haven't been deepened, such as empirical research on core competitiveness of power generating enterprises. At the same time, the big influential factors on the competitiveness of power generating enterprises are changing continuously with big future uncertainty; therefore, the research on system is only at present, which depends on further research to get improved.

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Table 1. Core Competitiveness Evaluation Index System of Power Generating Enterprises

Index level	Index level 1	Index level 2	Index level 3
Core	Scale resource strength X1	Power competitiveness X11	Total installed capacity X111
			Power Structure X112
		Performance index X12	ROE X121
Asset-liability ratioX122			
Fixed costs X123			
Total assets turnover X124			
Technical economy index X13			Average electricity price X131
		Equivalent availability factor X132	
		Number of unplanned outages X133	
		Installed capacity per kilowatt X134	
		Standard coal consumption rate of electricity X135	
		Integrated power consumption rateX136	
		Power consumption of integrated water X137	
		Fuel /coal X138	
Evaluation		Environmental impact X14	Investment rate of desulfurization equipment X141
			Environmental technology projects X142
			Dust, waste water, sulfur dioxide, nitrogen oxides, noise emissions X143
		Information Construction X15	Computer networks and management information system X151
			Accuracy of smooth and timely information system X152
Computer network security protection measures X153			
Index	System foundation ability X2	Planning Scheme X21	Development of business planning X211
			The implementation of the task or index X212
			Analysis of economic activity X213
		Standardization X22	Integrity of corporate standards and system X221
			Continuous improvement system X222
		Decision-making and supervision X23	“Three emphasis and one importance”decision-making system X231
			Economic responsibility audit and monitor the rectification X232

Index level	Index level 1	Index level 2	Index level 3
System of Power Generating Enterprises	Technical management ability X3	Production management X31	Equipment Maintenance Management X311
			Scheduling Management X312
			Technical supervision and management X313
			Economic Operation Analysis X314
			Equipment Identity Management X315
			Delegate management of production operation X316
		Human Resource Management X32	Organization X321
			Staff training system X322
			Employee Performance Evaluation System X323
		File Management X33	Standardization, standardization, modernization of file management X331
			Special inspection on completed records X332
	Culture knowledge ability X4	Corporate Culture X41	Adaptive Corporate Culture X411
			Corporate value X412
			Corporate social image X413
		Corporate Strategy X42	Business philosophy X421
			Business targeting X422
		Learning Innovation X43	Learning ability X431
			Ability to collect and process information X432
			Integrity degree of innovation system X433
			Scientific and technological innovations X434

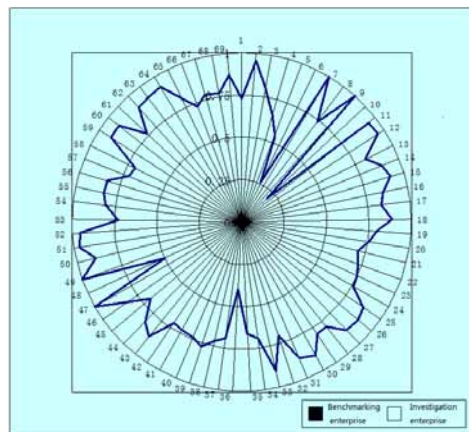


Figure 1. Radar Map on Simulating Core Competitiveness of Power Generating Enterprises