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A fuzzy comprehensive evaluation on corporate social responsibility of baoshan iron & steel Co., Ltd. from the stakeholders perspective

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ABSTRACT

This paper constructed corporate social responsibility analytic framework by the stakeholder theory, determined the contents of corporate social responsibility for every different stakeholder, established evaluation index system of corporate social responsibility and a series sets of the factors, evaluation and weighting under the stakeholder's perspective. After that, this paper established evaluation model of corporate social responsibility by the method of fuzzy comprehensive evaluation, by which this paper analyzed the corporate social responsibility of Baoshan Iron & Steel Co., Ltd. from stakeholders' respective, and the result not only scientifically judged the corporate social responsibility status of Baoshan Iron & Steel Co., Ltd., but also provided quantitative basis for public to supervise and evaluate the fulfillment of corporate social responsibility.

KEYWORDS

Stakeholders; Corporate social responsibility; Fuzzy comprehensive evaluation; Baoshan iron & steel Co., Ltd.

INTRODUCTION AND LITERATURE REVIEWS

In recent years, with the rapid economic development and the increasing pollution in China, the two-side nature of the corporate has been recognized by more and more people and organizations-so called stakeholders-including authorities, stockholder, resident community, executives and consumers. The advantage of the corporate is that they can make so much social fortune, oppositely, they are also consuming and wasting the nature resources and producing more and more pollutions, it is the disadvantage. Under this circumstance, many experts and scholars pay more attention to the corporate social responsibility (abbr. CSR) and change the research emphasis from the qualitative study to the quantitative study. Then how to select the indexes is the key factor for the quantitatively evaluating CSR. Because of lacking the system and method to evaluate CSR in China, the fulfillment of the Chinese enterprise CSR is in the lower level.

CSR is overpass the old idea of first-stockholder and more emphasis the importance of the stakeholders involving customers, creditors, suppliers, employees, competitors, authorities and communities[1]. Freeman defined the stakeholders in an organization as anybody or any group which have interaction effect on the organizational purposes. He said that according to stakeholder theory, every corporation has its unique stakeholders that influence, and simultaneously are affected by; its actions[2]. Wood also thought that corporation has predetermined contracts and commitments, internally and externally, with different parties, which need to be fulfilled[3]. Based on the two opinions, we can conclude the definition of the stakeholder-oriented CSR in this research, namely in the market-oriented economy the enterprises should undertake initiatively the responsibility for the different stakeholders and realize the harmonious and sustainable development between enterprises and society. The evaluation of CSR is the special measuring process for the implementation of CSR using the scientific method and the given index or standard. In consideration of too many impact factors involved in the stakeholder-oriented CSR, and these impact factors are unsure and fuzzy, it is very necessary to build evaluation set, index set and weight set for evaluating the stakeholder-oriented CSR, moreover, these can improve the integrated evaluation's validity and reasonability[4]. Hence building the CSR evaluation system in the respective of the stakeholder not only provides the reference standard of measuring CSR for the authorities and public, but also guides the enterprises to better implement the CSR for the different stakeholders in order to realize the harmonious development between economic profit and the social benefit, in a result, promoting the whole valuation of the enterprises.

METHOD

AHP is a comprehensive, integrated and systematic engineering method from the qualitative analysis to the quantitative analysis and is widely used in making decisions for the more complex and constrains and difficult to quantify problems[5]. This paper mainly used the AHP to make sure the weight analysis of the urban resident ecological consumption.

Fuzzy evaluation is based on the fuzzy mathematics and the principle of the fuzzy synthesis and quantifies the influence factors which are unclear boundary and difficult to quantify[6]. This method has the characteristics of science, adaption, rationality and operability. The ecological consumption behavior of the urban resident is influenced by many factors such as the surrounding crowd, the product promotion and the governments encourage policies and so on. We can't know exactly the influence extent of these factors, so the fuzzy evaluation is suitable for this situation.

Excel2007 is used to conduct and analyze the data in this paper.

THE MODEL'S CONSTRUCTING PROCESS

Building the evaluation index set

The evaluation index set is the collection of the impact factors to CSR, we call it U, and $U=\{u_1, u_2, \ldots, u_n\}$. Then it is divided many groups $U=\{U_1, U_2, \ldots, U_k\}$, and we make $U=\bigcup_{i=1}^{k} u_i$, $u_i \cap u_j = \emptyset (i \neq j)$,

which describes the n kinds of factors on the implementation of CSR and comprehensively reflects the quality of the CSR implementation.

Building the evaluation set

The evaluation set is made of the evaluation results such as excellent, good, medium and poor. The evaluation set is called V and $V=\{v_1, v_2, \ldots, v_m\}$, v_m describes the m kinds comment for every evaluation index.

Making sure the weight of the indexes

The index weight express the relative importance of the index in the whole evaluation. AHP is a multiple-principle making-decision method pointed out in 1970's[7], and belongs to the subjective weighting method, it can express the decision maker preference and suitable for the lower relative indexes[8]. Considering the particularity of the selected indexes for the CSR, this research uses the AHP to make sure the weight of the indexes.

The first step is to design the evaluation of quantitative standard.

TABLE 1 : Evaluation of quantitative standard

Evaluation set	quantitative standard	evaluation assessment	medium score
V1	V>90	excellent	95
V2	80 <V≤90	good	85
V3	70<V≤80	medium	75
V4	60<V≤70	poor	65
V5	V≤60	very poor	55

The second step is to calculate the index weight. Firstly, calculate the product of the elements of judgment matrix in every line, calling it M_i and $M_i=\prod_{j=1}^{n} a_{ij}$, i=1, 2, …, n; then calculate the root vector W_i', $W_i'=[M_i]^{i/n}$, i=1, 2, …, n; at last after normalization of the root vector, obtain the sorting weight vector $W^*=(W_1, W_2, \ldots, W_n)^T$, and make $W=(W^*)^T=(W_1, W_2, \ldots, W_n)$, namely, needed weight.

The third step is to make the consistency check. Firstly calculate the consistency index C.I, CI=(λmax-n)/(n-1), among these, λmax is the biggest characteristic root of the judgment matrix and n is the order number of the judgment matrix; then calculate average and random consistency index R.I; at last calculate the ratio of the consistency C.R., C.R.=C.I./R.I. When C.R. <0.1, the consistency of this judgment matrix is accepted.

Building the judgment matrix

Following we did the single factor on u_i (i = 1, 2,…,n). Assuming the membership degree r_{ij} is the one of the factor u_i for evaluation V_j (j = 1, 2, …,m), and then we would obtain the single factor judgment set $r_i=\{r_{i1}, r_{i2}, \ldots, r_{im}\}$, therefore the single factor judgment set for n factors is emerged and called R.

$$\mathbf{R}=(r_{ij})_{n\times m}=\begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{bmatrix}, \text{(i=1, 2, …, n; j=1, 2, …,m)} \quad (1)$$

Calculating the comprehensive evaluation result by fuzzy synthesis

There are many tapes calculation of the fuzzy synthesis, among them, the following four types are popular, they are models of outstanding main factor M (∧,∨)and M (·,∨), models of weighting

average M (∧,⊕) and M (·,⊕)[9]. Because models of outstanding main factor pay more attention to the very important impact factors instead of ignoring the other factors, it has a little disadvantage and not suitable for the stakeholder-oriented CSR. Taking full consideration of complexity for evaluating CSR, this research chooses the model M (·,⊕) to fuzzy synthesis for the evaluating results.

Then introduce the decision set B and make fuzzy synthesis B=W ○R, namely using the model M (·,⊕) to combine W and R and get the fuzzy comprehensive evaluation result vector B. The calculation formula is below:

$$b_i = \sum_{i=1}^{n}(w_i \cdot r_{ij}) = \min(1, \sum_{i=1}^{n} w_i \cdot r_{ij}), \quad j=1, 2,\ldots, m \qquad (2)$$

In the above formula, b_i is the ith membership degree, w_i is the ith evaluation index weight and r_{ij} is membership degree for the ith evaluation index and jth level.

FUZZY COMPREHENSIVE STAKEHOLDER-ORIENTED CSR EVALUATION FOR BAOSHAN IRON & STEEL CO., LTD.

Baoshan Iron & Steel Co.,Ltd. (hereinafter referred to as Baosteel) is a typical enterprise arising from China's reform and opening-up. After over 30 years of development, Baosteel has grown into China's most competitive iron and steel group with the highest level of modernization. At the end of 2012, Baosteel had a total of 130,401 employees located all across the world. Baosteel has continued its strategic transformation from "iron and steel to materials, from manufacturing to services and from China to the world" and adhere to sincerity, friendship and creativity in the creation of shared values for all stakeholders. It has published the CSR report for six years and is the model concerning the stakeholders.

In this part we will take Baosteel as an case to evaluation its CSR by using the fuzzy comprehensive evaluation method. This research obtain the data by the questionnare investigation to the experts. For the sake for the quality of the questionnare investigation, we had two time pre-investigation. Based on the feedback information of the two pre-investigation, the final questionnare was sure.

Designing the indexes of stakeholder-oriented CSR

Based on the published CSR report by Baosteel, we concluded the six stakeholders of the Baosteel, respectively stockholder, consumer, employee, supplier, community and authority. These vectors were called the first level indexes, and then we divided them into the seventeen second level indexes for the sake of more research. At the same time the design of the indexes is referenced by the Yang Rong (2011) and Tang Xiaofen (2010)[10,11]. The index system is seen in the below TABLE 2.

Making sure the weight of the first and second indexes

Firstly, for the first level index, we build the judgment matrix S and use the AHP to calculate the biggest characteristic root λmax=6.0172. Then make the consistency check, R.I. is related to the order number of the judgment matrix and according to the order number of the judgment matrix, this paper made sure that R.I.=1.24, and then got the result of the consistency index: CR=0.00277<0.10, from the result, we think the judgment matrix had passed the consistency check. The detailed process is below.

Finally, the weight coefficient matrix is W=(0.2323, 0.1161, 0.2323, 0.1161, 0.2323, 0.0709).

According to the same theory and process, we can get six weight coefficient matrixes of the second level index.

The weight coefficient matrix for the stockholders: W_1=(0.297, 0.164, 0.539)
The weight coefficient matrix for the consumers: W_2=(0.250, 0.750)
The weight coefficient matrix for the employees: W_3=(0.420, 0.380, 0.200)
The weight coefficient matrix for the suppliers: W_4=(0.480, 0.240, 0.160, 0.120)

The weight coefficient matrix for the community: W_5=(0.167, 0.333, 0.500)
The weight coefficient matrix for the authority: W_6=(0.667, 0.333)

TABLE 2 : Evaluation factors system for stakeholder-oriented CSR

the first level index	symbol	the second level index	symbol
stockholder	U_1	rate of return on common stockholders' equity	U_{11}
		rate of return on total assets	U_{12}
		capital maintenance and appreciation rate	U_{13}
consumer	U_2	product qualification ratio	U_{21}
		customer satisfaction degree	U_{22}
employee	U_3	employee compensation payment ratio	U_{31}
		employee social insurance covering ratio	U_{32}
		per expenditure on education	U_{33}
supplier	U_4	turnover ratio of accounts payable	U_{41}
		cash payable rate	U_{42}
		contract fulfillment ratio	U_{43}
		eco-purchase ratio	U_{44}
community	U_5	employment contribution ratio	U_{51}
		donation income ratio	U_{52}
		eco-investment ratio	U_{53}
authority	U_6	taxed asset ratio	U_{61}
		withdrawal ratio of social insurance	U_{62}

Building the comment set matrix

We asked ten experts to comment Baosteel CSR by the questionnaire and counted the result. Then we built the comment set matrix based on the statistics. For example, as for the rate of return on common stockholders' equity, two experts' comments are excellent; six experts comments are good; two experts' comments are medium; and zero expert' comment is poor or very poor, the evaluation vector is (0.1, 0.5, 0.4, 0, 0). By the same rule, we can calculate the other indexes' evaluation vectors, which will make up the comment set matrix.

The fuzzy comprehensive evaluation for the second level index

Here A_1 is the representative of the fuzzy synthesis vector of U_1={U_{11},U_{12},U_{13}};

A_2 is the representative of the fuzzy synthesis vector of U_2={U_{21},U_{22}}; A_3 is the representative of the fuzzy synthesis vector of U_3={U_{31},U_{32},U_{33}};A_4 is the representative of the fuzzy synthesis vector of U_4={U_{41},U_{42},U_{43},U_{44}}; A_5 is the representative of the fuzzy synthesis vector of U_5={U_{51},U_{52},U_{53}}; A_6 is the representative of the fuzzy synthesis vector of U_6={U_{61},U_{62} }.

The formula is $A_i=W_i \circ U_i$ and the model is M (·,⊕). The outcomes are below.

A_1= (0.113, 0.546, 0.341, 0, 0); A_2= (0.125, 0.425, 0.375, 0.075,0);
A_3= (0.062, 0.542, 0.358, 0.038,0); A_4=(0.092, 0.584, 0.300,0.024,0);
A_5= (0.167, 0.616, 0.217, 0, 0); A_6= (0, 0.6, 0.333,0.067, 0).

Calculating the final fuzzy comprehensive evaluation score

B is the fuzzy comprehensive result of the second index of CSR and $B=W \circ R$=(0.10450, 0.55555, 0.31467, 0.02505, 0). After the normalization, B^*=(0.105, 0.556, 0.314, 0.025, 0), and then we can calculate the final fuzzy comprehensive evaluation score Z and it is 82.341.

CONCLUSION

On behalf of the above score 82.341, we think the CSR of Baosteel for the stakeholders is good. In fact, Baosteel has always been working on the CSR in the stakeholder's respective for many years. Hence today its performance in CSR can be accepted by the experts, stockholders, consumers, suppliers, employees, community and authority and it becomes a learning model of many other enterprises in China.

As we know, the iron and steel industry is the high-polluted because it not only produces much waste water, waste gas and waste solid, but also over consumes the nature resources. Therefore the iron and steel industry faces significant challenges in the global climate of energy conservation and emission reduction. Based on such realization, Baosteel proposed its environment management strategy in 2009 and it became the most important part of CSR. Environment management covers the comprehensive process of the enterprise, including product development, product design and product manufacturing. It also binds and guides the behaviors of employees and industry chain partners.

Besides, Baosteel fulfills the training plan to improve the employees' capability in order to realize the harmonious improvement of the employee and corporate; Baosteel is keen the charitable affairs and devoted to the education, medicine, community and environmental protection; Baosteel also produces the green product for the consumers and obeys the contracts with the suppliers and so on. In a word, Baosteel' CSR strategy and implementation provides much valuable experience and enlightenment to us.

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REFERENCES

[1] Wayne Visser, Dirk Matten, Manfred Pohl; The A to Z of Corporate Social Responsibility. Revised and Updated Edition, **5**, 65-67 **(2010)**.
[2] E.Freeman; Strategic Management: a Stakeholder Approach. Prentice-Hall, Englewood Cliffs, 56-61 **(1984)**.
[3] D.Wood; Corporate social performance revisited. Academy of Management Review, **16**, 691-718 **(1991)**.
[4] Yu Huiqin; A Fuzzy and Integrated Evaluation on Corporate Social Responsibility Based on the Stakeholders. Journal of Huaiyin Institute of Technology, **20(3)**, 80-84 **(2011)**.
[5] Liu Qiang, Zhou Ping; Analytic Hierarchy Process in the Weight Analysis of Each Effect Factor of Urban Domestic Water Duties. Journal of Shenyang Jianzhu University: Natural Science, **28(2)**, 330-337 **(2012)**.
[6] Du Dong, Pang Qinhua; Modern Comprehensive Evaluation Method and Cases. Peking, Tsinghua University Press, peking, 35-36 **(2005)**.
[7] H.Min, E.Melachrinoudis; The relocation of a hybrid perspectives: a case study. International Journal of Management Science, **27(1)**, 75-85 **(1999)**.
[8] Deng Xue, Li, Jiaming, Zeng Haojian; Research on Computation Methods of AHP Wight Vector and Its Applications. Mathematics in Practice and Theory, **24(7)**, 93-100 **(2012)**.
[9] Li Yulin, Gao Zhigang, Han Yanling; The Determination of Weight Value and the Choice of Composite Operators in Fuzzy Comprehensive Evaluation. Computer engineering and applications, **23**, 38-43 **(2006)**.
[10] Yang Rong, Shen Xing; Evaluation index selection for the oil companies in the respective of the stakeholder. Business Accounting, **30(3)**, 33-35 **(2011)**.
[11] Tang Xiaofen; The implementation and evaluation of Corporate Social Responsibility. China standard press, Peking, **(2010)**.