Research on the Index System of Sustainable Development of Traditional Energy Enterprises

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Keywords: Sustainable Development, Traditional Energy Enterprises, Technological Capability

Abstract: For the traditional enterprise sustainable development of technological capabilities, the main research of domestic scholars is to use the high-tech to improve the technology, scholars take coal, textile, automobile, petrochemical and other traditional enterprises as an example, to explore the process of high-tech transformation of traditional enterprises, and combined with the actual situation, put forward the corresponding countermeasures and suggestions for sustainable development.

Introduction

After the global financial crisis, the United States, Germany, Japan and other countries believe that a few years ago to ignore the development of traditional enterprises is one of the important reasons for the outbreak of the global financial crisis, they have launched a national "re-manufacturing" and to speed up the traditional enterprise for sustainable development strategy. Report of the eighteenth National Congress of the Communist Party of China ,"to speed up the traditional enterprise for sustainable development" was first written in, it highlights the importance of sustainable development in the traditional national strategy. As the main factor affecting the sustainable development of the traditional enterprise, the technological capability has provided an important support and guidance for the sustainable development of traditional enterprises, and it can effectively promote the sustainable development of our country's traditional enterprises,solve technical hollow issues and achieve sustainable development of traditional enterprises. [1]

In the above background, we are faced with an important problem: Method used traditional energy companies is extensive, with low energy efficiency, environmental pollution, is not conducive to the sustainable development of traditional capacity of enterprises. At this environmentally conscious age, traditional energy companies also should adjust the industrial chain construction industries, the shift from traditional single energy companies to integrated energy group to accelerate the realization of the traditional enterprise restructuring and its sustainable development through the continuous improvement of its technological capabilities. [2]

Analysis on the influencing factors of sustainable development of traditional energy enterprises

In order to measure and evaluate the technical ability, this article will break it down according to its classification and find out the following factors: innovative ideas capability, conception evaluation ability, R & D capabilities, technical production capacity, technological achievements commercialization capabilities and so on.

Evaluation index system of technological capability improvement of traditional energy enterprises

Combined with traditional energy companies, this paper will take the ability of innovative ideas, the idea of evaluation capacity, R & D capability, technical capacity and ability to commercialization of technological achievements as a five-level indicators, the impact factor as a secondary index,

initially identified some of the impact of technology capacity factor, and then by conducting in-depth interviews with senior management of the enterprise, after finishing, synthesis and modification, and ultimately the evaluation index system of technological capability improvement of traditional energy enterprises was founded. Based on the above analysis,we can get the evaluation index system of technological capability improvement of traditional energy enterprises. As shown in Figure 1

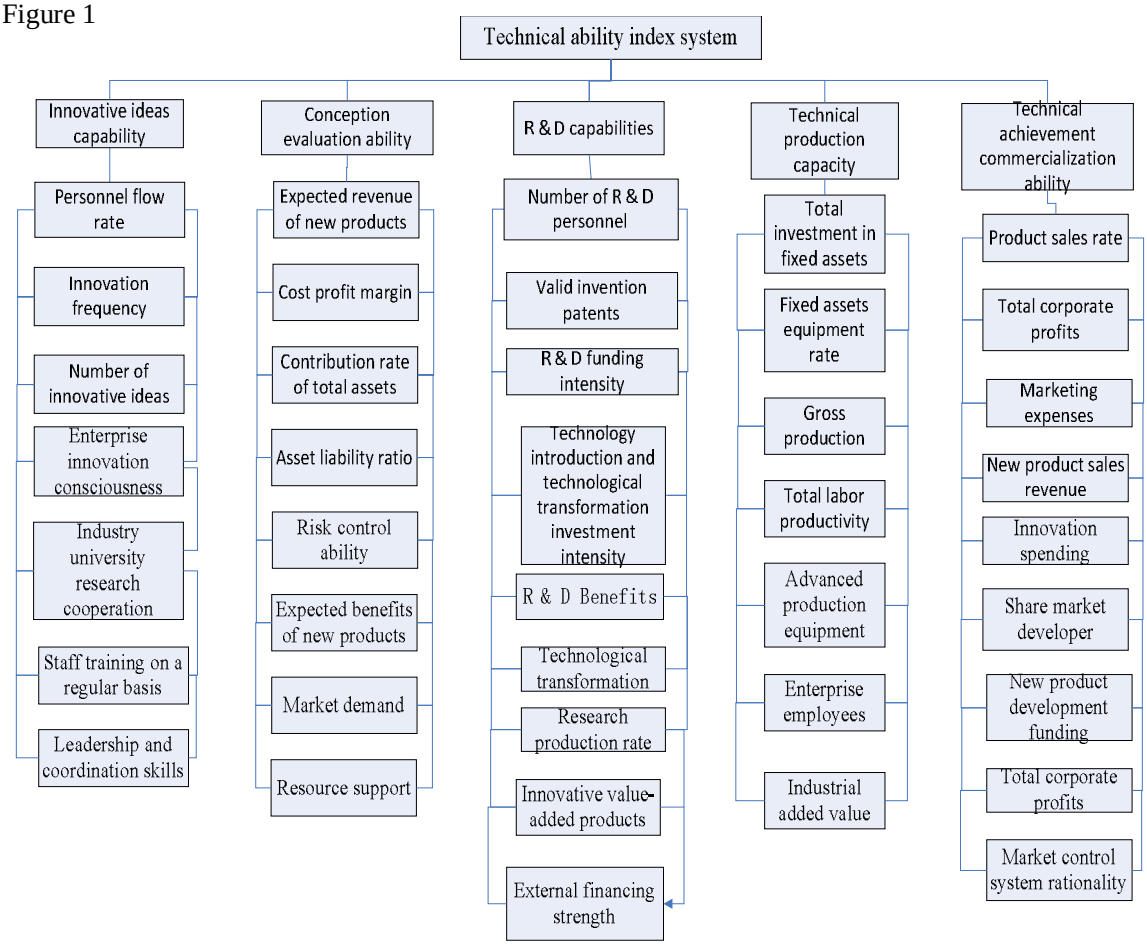

Fig.1 Evaluation index system of technological capability improvement of traditional energy enterprises diagram

Identification of sustainable development factors in traditional energy enterprises technological capabilities

The research of technological capability improvement of traditional energy enterprises is closely related to the sustainable development. Analyzing its transformation factors from the perspective of technological capabilities, and forming a sustainable development plan ultimately.In this paper, the HMM method is introduced.

Definition 1: The technical ability of the factor is n, the technical ability factor set $S=\{S_1, S_2,... S_n\}$, sustainable development factor is m, with a sustainable development factor set $V=\{V_1, V_2,...V_m\}$.

Definition 2: it will cause factor corporate sustainability from a technical capacity factors changed to another the probability of a factor set $A = \{a_{ij}\}$, become sustainable development factor $B = b_i(k)$, the initial probability factor for $B = \{\pi_i\}$.

Definition 3: Sequence $O = (O_1, O_2, O_3, \ldots O_r)$. It is the highest degree of factors related to sustainable development. [3]

According to the technological capability transformation process to define Ot, and define the sustainable development factor is Si. The proportion of non-dimensional treatment as factors become the initial probability factor for sustainable development is πi. As shown in Table 1.

Table 1 Analysis on the factors of sustainable development of traditional energy enterprise

O_t	S_i	Accounting for the proportion C_i	π_i
Innovative ideas capability O_1	Personnel flow rate S_1	0.3	0.3
	Innovation frequency S_2	0.2	0.2
	Number of innovative ideas S_3	0.51	0.5
Conception evaluation ability O_2	Expected revenue of new products S_4	0.97	0.23
	Cost profit margin S_5	1.01	0.24
	Contribution rate of total assets S_6	1.27	0.30
	Asset liability ratio S_7	1.01	0.24
R & D capabilities O_3	Number of R & D personnel S_8	0.1	0.23
	Valid invention patents S_9	0.06	0.14
	R & D funding intensity S_{10}	0.2	0.45
	Technology introduction and technological transformation investment intensity S_{11}	0.08	0.18
Technical production capacity O_4	Total investment in fixed assets S_{12}	0.7	0.18
	Fixed assets equipment rate S_{13}	1	0.26
	Gross production S_{14}	1.3	0.34
	Total labor productivity S_{15}	0.88	0.23
Technical achievement commercialization ability O_5	Product sales rate S_{16}	0.13	0.25
	Total corporate profits S_{17}	0.23	0.44
	Marketing expenses S_{18}	0.09	0.17
	New product sales revenue S_{19}	0.07	0.13

Using Delphi's method, the sustainable development factor is the possibility of sustainable development. As shown in Table 2.

Table 2 HMM determine fluid transition factor calculation result

O_t	V_i（Sustainable development factor）	π_i	$b_j(k)$	a_{ij}
Innovative ideas capability O_1	Personnel flow rate S_1	0.3	0.18	
	Innovation frequency S_2	0.2	0.12	
	Number of innovative ideas S_3	0.5	0.7	
Conception evaluation ability O_2	Expected revenue of new products S_4	0.23	0.22	
	Cost profit margin S_5	0.24	0.19	
	Contribution rate of total assets S_6	0.30	0.35	
	Asset liability ratio S_7	0.24	0.24	
R & D capabilities O_3	Number of R & D personnel S_8	0.23	0.22	
	Valid invention patents S_9	0.14	0.06	
	R & D funding intensity S_{10}	0.45	0.59	
	Technology introduction and technological transformation investment intensity S_{11}	0.18	0.13	
Technical production	Total investment in fixed assets S_{12}	0.18	0.11	
	Fixed assets equipment rate S_{13}	0.26	0.25	

aij	S_1	S_2	S_3
S_1	0	0.07	0.3
S_2	0.1	0	0.4
S_3	0.08	0.05	0

a_{ij}	S_4	S_5	S_6	S_7
S_4	0	0.06	0.14	0.1
S_5	0.08	0	0.1	0.09
S_6	0.05	0.05	0	0.05
S_7	0.09	0.08	0.11	0

a_{ij}	S_8	S_9	S_{10}	S_{11}
S_8	0	0.01	0.13	0.02
S_9	0.1	0	0.27	0.1
S_{10}	0.02	0.01	0	0.01
S_{11}	0.1	0.04	0.19	0

a_{ij}	S_{12}	S_{13}	S_{14}	S_{15}

capacity O_4	Gross production S_{14}	0.34	0.43		S_{12}	0	0.1	0.23	0.13
	Total labor productivity S_{15}	0.23	0.21		S_{13}	0.04	0	0.11	0.06
					S_{14}	0.02	0.06	0	0.02
					S_{15}	0.05	0.09	0.09	0
Technical achievement commercialization ability O_5	Product sales rate S_{16}	0.25	0.23		a_{ij}	S_{16}	S_{17}	S_{18}	S_{19}
	Total corporate profits S_{17}	0.44	0.5		S_{16}	0	0.12	0.04	0.03
	Marketing expenses S_{18}	0.17	0.17		S_{17}	0.02	0	0.03	0.02
	New product sales revenue S_{19}	0.13	0.1		S_{18}	0.1	0.12	0	0.05
					S_{19}	0.11	0.26	0.1	0

Conclusion

The use of the HMM algorithm for decoding problem of Table 2 are solved to obtain q1 * = δ1 (3), q2 * = δ2 (4), q3 * = δ3 (11), q4 * = δ4 (14), q5 * = δ5 (17). From the results can be seen, the sustainable development of traditional energy companies are: the number of innovative ideas, new products are expected to yield, technology introduction and technological transformation of input intensity, enterprise product value, new product sales revenue.

According to the sustainable development of factor above calculation results obtained can be drawn see, the idea of innovation and the number of traditional energy companies, the expected benefits of new products, technology transfer and technological transformation strength, gross production, sales of new products and other factors indicators changes will directly affect fundamental changes in the traditional energy companies, it is to determine the movement of corporate sustainability because the decision lies. Therefore, traditional energy companies need to target the above factors, to determine the direction of sustainable development path and the specific implementation plan in combination with their own development needs and development capabilities.

Acknowledgements

This work was financially supported by the Qingdao social sciences project (QDSKL130138), Shandong University research project (J13WG25), National Natural Science Foundation(71332007), Key topics of Arts and Sciences in Shandong Province (1506579), Particular Postdoctoral Science Foundation Project(2014T70058), Statistical research key project of Shandong Province.(KT15055; KT15056).

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