Construction of Evaluation Index System of the World-class Enterprises Oriented by Environmental Protection——the Case of the Electric Power Industry

Zilin Ma [1, a*], Tianya Liu [2, b], Xuanxiang Zhu [3, c], Xiao-feng Zhang [4, d]
[a]e-mail: zlma@stu.xidian.edu.cn, [b]e-mail: 21061212599@stu.xidian.edu.cn, [c]e-mail: 21061212602@stu.xidian.edu.cn, [*]Corresponding author: zlma@stu.xidian.edu.cn, [d]e-mail: sgerizxf@163.com

[123] School of Economics & Management Xidian University Xi'an, China

[4] State Grid Energy Research Institute Beijing, China

Abstract—This paper firstly analyzed the connotation and evaluation system of world-class enterprises proposed by the previous research, and then took the electric power industry as an example and screened the key indicators. Finally, we formed an evaluation index system of world-class enterprises which is oriented by environmental protection. The index system included five dimensions: scale, performance, growth and development, international influence, and customer service. The index system also contained 12 secondary indicators and 37 specific indicators. This study not only fills the gaps in electric power enterprises establishing a world-class evaluation index system, but also provides reference for enterprises achieving the goal of building a world-class enterprise.

Keywords-world-class; evaluation index system; energy power industry; protection oriented

1 INTRODUCTION

A growing number of enterprises regard world-class as their strategic goal. To promote the company to enter the ranks of world-class enterprises, it's necessary to clarify the connotation of world-class enterprises, and then build an evaluation index system. Since constructing an index system is not only the premise to achieve the strategic goals of enterprises, but also an important method of the scientific evaluation of their first-class work.

At present, many researchers and departments mainly focus on the ranking and characteristic analysis of world-class enterprises in some fields such as postal, aviation, and financial industries while studies on the connotation and systematic evaluation of world-class enterprises are rare. Especially, there's been limited research on large-scale electric power enterprises. Furthermore, existing evaluation index systems mostly focused on risk, innovation, or performance evaluation, and relatively few studies highlighted environmental factors. Paying attention to environmental protection not only meets the basic requirements of China's energy

MSIEID 2022, December 09-11, Chongqing, People's Republic of China

DOI 10.4108/eai.9-12-2022.2327694

development, but also is a necessary measure to promote ecological environmental protection. Highlighting the environmental protection index in the evaluation system can attract enterprises' attention and lead enterprises to achieve sustainable development. Thus, we systematically reviewed the previous studies on enterprise evaluation and then put forward an environment-oriented evaluation index system of the electric power industry.

2 LITERATURE REVIEW

"World-class", as an applied research topic, is often combined with enterprise management practice. In academic research, most studies tried to understand the concept from the perspective of enterprise attributes and characteristics in the past. Boston Consulting Group proposed that world-class enterprises should have sufficient capital flows, cross-industry information insight, managerial talent, and brand value [1]. Huang et al believed that world-class enterprises refer to global leaders who have industry influence, market competitiveness, and comprehensive strength for a long time in their industries or key fields [2]. Wang and Liu maintained that a world-class enterprise takes first place in many aspects, such as scale, international operation ability, core competitiveness, technological level, brand influence, and industry status [3].

In general, "world-class" tend to be measured by multiple dimensions and it's often analysed with a combination of static and dynamic factors. Therefore, this paper proposes that a world-class enterprise refers to a leading enterprise group in a certain industry or field with high recognition, competitiveness, and influence in terms of enterprise-scale, performance, growth and development, international influence, customer service, and other comprehensive strengths.

In recent years, research about the index system of world-class enterprises has been carried out by different institutions and scholars at domestic and foreign. According to the Development Research Center of the State Council, the factors that determine the international competitiveness of large enterprises include scale, efficiency, growth, and internationalization. McKinsey has established a world-class enterprise evaluation system with equal emphasis on "performance" and "health". The performance indicators include six aspects such as global influence and product innovation, and the organizational health indicators include six aspects such as direction, talent, and incentive. In the world-class enterprises' evaluation research conducted by GlocalWin, the enterprise evaluation system is divided into business capacity, financial performance, and technical and economic. The State Grid Energy Research Institute Co., Ltd., etc. jointly construct benchmarking index system, which includes four dimensions: scale, performance, management, and sustainable development. China Business Journal adopts five first-level indicators including scale, growth, efficiency, economic technology, and popularity, and 15 specific indicators to form the evaluation index system of enterprise competitiveness. More details are summarized in Table 1.

Table 1 Summary of a World-class Enterprise Evaluation System

Name	First-level Indicators	Secondary Indicators	Specific Indicators	Indicators Direction
Development	scale	—	sales revenue, net profit	(1), (2),

research center of the state council	efficiency	—	return on total assets, gross profit margin	(3), (5)
	growth	—	R&D input ratio, average sales revenue growth rate over the past three years, average net profit growth rate over the past three years	
	internationalization	—	the ratio of overseas assets to total assets, the ratio of overseas revenue in total sales revenue, the ratio of overseas employees in total employees	
McKinsey world-class enterprise evaluation system	performance	—	value creativity, market leadership, global influence、resource operation capability, product innovation competence, environmental sustainability	(1), (4), (5)
	health	—	leadership, orientation, culture & atmosphere, accountability, coordination & control, talent, incentive, innovation & learning	
GlocalWin world-class enterprise evaluation benchmarking system	business capacity	asset	asset size	(1), (2)
		capital	ownership interest	
		market value	market value	
		employee	number of employees	
		operating revenue	operating revenue	
		society contribution	EBITDA	
	financial performance	profitability	return on sales, security surplus cash multiples, the ratio of profits to cost, return on invested capital	
		asset quality	the velocity of liquid assets, cash return on assets	
		debt risk	liquidity ratio, cash flows coverage ratio, interest-bearing liability ratio	
		business growth	comparable store sales growth, total assets growth rate, technical input ratio	

	technical and economic	technical level, management level, economic effects	the indicators that accord with the characteristics of the industry and reflect the core competitiveness of enterprises	
International leading enterprises benchmarking index system	scale	scale	total assets, market value, operating revenues, total profit, the proportion of international business	(1), (2), (3), (5)
		revenue		
		contribution		
		international competitiveness		
	performance	profitability	return on equity, net profit growth rate, revenue growth rate	
		asset utilization efficiency		
		capacity to resist risk		
	management	production & operation	safety accident rate	
		input-output efficiency	the average rate of profit, the ratio of profits to cost	
	sustainable development	innovation input	technical input ratio	
China Business Journal competitiveness evaluation index system	scale	—	sales revenue, net asset, net profit	(1), (2), (3), (4)
	growth	—	sales revenue growth in the past three years, average net profit growth in the past three years	
	efficiency	—	net assets profit rate, the contribution rate of total assets, overall labor productivity, the ratio of export earnings to sales revenue	
	technology	—	the proportion of technical renovation investment and information construction in sales revenue over the last three years, the proportion of R&D expenditure, number of patents	
	popularity	—	public evaluation, financial reporter evaluation, industry analyst evaluation	

Based on the existing research, this paper summarizes the following characteristics of a world-class index system. As for the evaluation content, indicators can be divided into (1) scale, (2) performance (operations, management, and finance), (3) growth and development, (4) soft power, and (5) international influence. About the selection of indicators, the evaluation systems focus on operating income, profit level, asset quality, brand value, R&D investment, and other indicators. As for the evaluation procedure, the current influential evaluation system often has strong operability and is mainly formed of quantitative indexes.

However, most index systems are not comprehensive and lack pertinence to some specific industries (e.g., the electric power industry). Moreover, soft power such as leadership, culture, and atmosphere are qualitative and subjective indicators that were difficult to compare. To some extent, soft power overlaps with the growth and development indicators, thus we drop soft power in our evaluation system. In the next part, we will combine the characteristics of the development of the electric power industry to extract appropriate refined indicators to build an indicator system.

3 CONSTRUCTION OF ENERGY POWER INDUSTRY INDEX SYSTEM

Our index system will follow these principles: reflecting the characteristics of world-class power enterprises, including relative and quantitative indicators, availability of data, and international comparability. Considering the unique features of the electric power industry, we construct the evaluation index system which includes 5 first-level indicators: scale, performance, growth and development, international influence, and customer service. In addition, it also includes 12 second-level dimensions and 37 specific indicators.

3.1 Scale

In this paper, operating income and total assets are selected as indicators to measure the enterprise revenue scale. In addition, we add the indicators in size configuration of power enterprises, including installed power capacity and installed power capacity using clean energy.

3.2 Performance

Performance indicators include operational, managerial, and financial indicators. In terms of operation, except for revenue, assets, and profit growth rate, we add the growth rate of electricity sales to measure the operation of electric power enterprises. As for management, we adopt the management lean indicators constructed by State Grid Energy Research Institute Co., LTD., which includes safety accident rate, the average rate of profit, and the ratio of profits to cost. As for financial indicators, the total profit is the most widely used indicator to measure profitability. We further add the returns on total assets and profit rate on cost into the evaluation system. These three indicators can mainly cover the profitability of an enterprise.

3.3 Growth and Development

Clean and low-carbon, digital transformation, and improvement of quality and efficiency have become important strategies and choices for the electric power industry. From the perspective of environmental protection and digitization, the index of growth and development is decomposed into innovation, sustainable development, risk resistance, and human resource. Innovation reflects the scientific and technological innovation in clean energy and environmental protection technology. Based on the technology input ratio, the number of invention patents, and the number of enterprises hosting or participating in the formulation of new standards [4], we further restrict the scope into the field of clean energy. Sustainable development mainly measures the investment level of environmental protection, the emission or utilization rate of air pollutants/wastewater, and the intelligent level of the grid. Specific indicators include clean energy investment ratio, smart grid investment, the comprehensive utilization rate of fly ash, wastewater utilization rate, the proportion of clean energy in installed power supply, $CO_2/SO_2/NO_X$ emission per unit of generating power, intelligent distribution network capacity, and proportion of electric energy in terminal energy consumption [5-9]. Risk resistance reflects that an enterprise can maintain normal operation and long-term development when faced with risks. It contains the asset-liability ratio and cash flow coverage ratio which is often used to describe risk tolerance. Human resource is fundamental to the growth of enterprises, and the quality and quantity of human resources are important guarantees for the long-term prosperity of enterprises. We use the talent equivalent density to measure human resource capacity.

3.4 International Influence

The international influence is measured by the transnational index and the ranking of the Top 500 World Brands. The transnationality index reflects the economic strength of enterprises' overseas business activities. The brand ranking is an intuitive index to reflect the competitiveness of enterprises. Both of them are constructed by authoritative organizations.

3.5 Customer Service

As an important basic industry of the national economy, the electric power industry is transforming from a traditional single product provider to a diversified “product + service” provider. Therefore, this paper adds the index of customer service to the index system. Power-supplying service quality is the most representative indicator to measure the service situation of a power enterprise. Five specific indicators are adapted and selected, including the comprehensive circuit loss rate, equipment failure rate, comprehensive voltage eligibility rate, average user interruption hours, and reliability on service in total [10]. For more details see Table 2.

Table 2 Summary of a World-class Enterprise Evaluation System

First-level Indicators	Secondary Indicators	Specific Indicators
Scale	revenue scale	operating income
		total assets

	size configuration	total installed power capacity
		installed power capacity using clean energy
Performance	operational performance	revenue growth rate
		assets growth rate
		profit growth rate
		electricity sales growth rate
	management performance	safety accident rate
		the average rate of profit
		the ratio of profits to cost
	financial performance	total profit
		the returns on total assets
		profit rate on the cost
Growth and development	innovation	clean energy technology input ratio, and the number of enterprises hosting or participating in the formulation of new standards
		the number of clean energy invention patents
		the number of new standards for clean energy that enterprises hosting or participate in
	sustainable development	clean energy investment ratio
		smart grid investment
		the comprehensive utilization rate of fly ash
		wastewater utilization rate
		CO_2 emission per unit of generating power
		SO_2 emission per unit of generating power
		NO_X emission per unit of generating power
		intelligent distribution network capacity
		the proportion of clean energy in installed power supply
		the proportion of electric power in terminal energy consumption
	risk resistance	asset-liability ratio
		cash flow coverage ratio
	human resource	talent equivalent density
International influence	international outlook	transnationality index[a]
	Brand image	the ranking of the Top 500 World Brands[b]
Customer service	Power-supplying service quality	the comprehensive circuit loss rate
		equipment failure rate
		comprehensive voltage eligibility rate
		average user interruption hours
		reliability on service in total

a. Transnationality Index (TNI) is an indicator to comprehensively evaluate the internationalization degree of an enterprise. TNI = (foreign assets/total assets + foreign sales/total sales + number of foreign employees/total employees)/3×100%. TNI comes from UNCTAD's 2019 list of the world's 100 largest multinational companies.

b. The World's Top 500 Brands list is published annually by World Brand Lab who is a leading independent brand evaluation and marketing strategy consultancy.

4 CONCLUSION

In this paper, we firstly define world-class enterprises. And then, an evaluation index system that is both embedded with the characteristic of the electric power industry and the environmental protection property is constructed, including 5 first-level indicators: performance, growth and development, international influence, and customer service. It also contains 12 second-level indicators and 37 specific indicators. The evaluation index system can provide guidance and support for electric power enterprises to rapidly build world-class enterprises.

Acknowledgment. This work was financially supported by the research on elements synergy model, evaluation system and continuous improvement program for establishing world first-class demonstration enterprise (1400-202057238A-0-0-00).

REFERENCES

[1] Boston Consulting Group, “Creating a world-class value creation enterprise group”, 2017.

[2] D. Wang, and Q. Liu, “More measures taken to cultivate world-class enterprises and promote the formation of a new development pattern,” Macroeconomic Management, vol. 5, pp. 14-20, 2017.

[3] Forward, “Report of market prospective and investment strategy planning on China smart grid industry (2021-2026),” Forward Industrial Research Institute, 2021.

[4] J. Chen, and Y. Chen, “The studies of indicators system on technology innovation performance in enterprises,” Science of Science and Management of S. T., vol. 3, pp. 86-91, 2006.

[5] L. Li, et al, “Energy conservation and emission reduction policies for the electric power industry in China,” Energy Policy, vol. 39, pp. 3669-3679, 2011.

[6] Q. Huang, J. Yu, and T. Wang, “How to be a world-class enterprise: international experiences and an insight into the development of the Chinese large enterprises,” China Industrial Economics, vol. 11, pp. 5-25, 2017.

[7] REN21, “2021: Renewable energy policy network for the 21st century,” Renewables 2021 Global Status Reporter, 2021.

[8] S. Yu, Y. Zheng, and L. Li, “A comprehensive evaluation of the development and utilization of China's regional renewable energy,” Energy Policy, vol. 127, pp. 73-86, 2019.

[9] T. Sun, X. Wang, and X. Ma, “Relationship between the economic cost and the reliability of the electric power supply system in city: A case in Shanghai of China,”Applied Energy, vol. 86, pp. 2262-2267, 2009.

[10] X. Yu, et al, “Optimal path for controlling pollution emissions in the Chinese electric power industry considering technological heterogeneity,” Environmental Science and Pollution Research, vol. 26, pp. 11087–11099, 2019.