Research on the performance evaluation system of digital government capacity building based on power data

Dawei Song[1], Yibo Jia[1], Zhe Ji[1], Yixue Yang[2*]

[1] Economic and Technological Research Institute of State Grid Henan Electric Power Company, Zhengzhou, Henan, China
[2] Xi'an International Studies University, Xi'An, China

*Corresponding auther's e-mail:2317006141@qq.com

Abstract. The use of power data to improve digital government capacity building is an effective way to realize the modernization of the national capacity system. By summarizing the application path of power data to empower digital government, six aspects including demand response, business support, data supply, coverage, generalization ability, and promotion and application are summarized. Establish an evaluation model in two aspects, and empower the evaluation indicators, and quantitatively evaluate the application status and effectiveness of power data in economic and social development and government modernization governance. This paper provides a quantifiable evaluation tool for the performance evaluation of power data to enhance digital government capabilities, deepened the theoretical research on the performance evaluation of digital government capabilities, and promoted the practical application of power data to improve the performance of digital government capabilities.

Keywords: electricity data, performance evaluation, digital government

1 Introduction

With the increasing development of Internet technology, the effectiveness of big data technology has become more and more in-depth in all aspects of human daily life, and the in-depth use of big data analysis has also brought a new historical opportunity to the reform and development of my country's traditional power industry and vitality. Through the cross-integration of internal and external data resources and the application of data mining analysis technology, power grid enterprises can improve the performance of the company as a whole internally, and also bring important new changes to the development model of my country's power grid business and the company's economic development model. Motivation, outside can improve the utilization efficiency of the company's resources, and fulfill the company's social responsibility. At the same time, the use of power data analysis can provide a new way for the government to improve the governance level, and help to reform and improve the management system, governance structure, government performance and governance form of government

X. Ding et al. (eds.), *Proceedings of the 2023 4th International Conference on Big Data and Social Sciences (ICBDSS 2023)*, Atlantis Highlights in Social Sciences, Education and Humanities 12,
https://doi.org/10.2991/978-94-6463-276-7_52

departments. Liu Mengjuan et al. (2023) believe that improving the quality of data administration is a key means to promote the construction of a service-oriented government and intelligent management[1]. Wang Peng et al. (2023) constructed a public service evaluation index system for digital governments in various provinces and cities in China from three dimensions: feasibility, scientificity, and innovation, in order to evaluate and enhance the public service evaluation capabilities of digital governments in various regions[2].

2 Establish a performance evaluation model for power data empowerment digital government capacity building

2.1 Objective Analysis of Establishing the Evaluation Model

At present, how to evaluate the effectiveness of power data empowerment of digital government capacity building has not yet been determined. The process of power data empowering digital government capacity building is a process of continuous development and improvement. By establishing an evaluation model index system, evaluate the effectiveness of the power data empowerment digital government in the process, as well as the results of the power data empowerment digital government construction, monitor at any time during the process, and give timely feedback in the results.

The evaluation index in this paper is to comprehensively evaluate the current application of the capacity building of digital government empowered by power data, and take "the current application of capacity building of digital government empowered by power data" as the overall goal G of the index level, as shown in Figure 1; the purpose of digital government empowered by power data Including the following aspects: 1) According to user needs and application scenarios, develop suitable applications and platforms, and then continuously improve and optimize the application system according to user feedback and business needs, so as to improve use value and user satisfaction. 2) Combine the application of power data with actual business scenarios to provide value for government management, corporate decision-making, and public services. 3) Promote the popularization and promotion of digital technology and innovative applications in the energy field, form a digital society and digital economic ecology, and create a modern energy system with coordinated development of energy, economy, society, and environment. Therefore, various indicators are further refined from the perspectives of demand response, business support, data supply, coverage, generalization capabilities, and promotion and application.

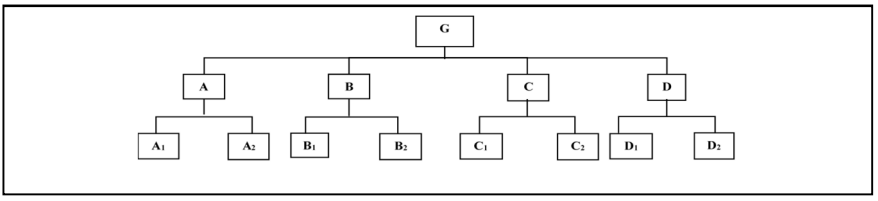

Fig. 1. Hierarchical structure of evaluation indicators

2.2 Collection of evaluation indicators

From the perspectives of demand response, business support, data supply, coverage, generalization capabilities, and promotion and application, relevant indicators for the performance evaluation of power data-enabled digital government capacity building are collected, as shown in Table 1.

Table 1. Collection of demand response evaluation indicators

category	literature	Collection of relevant indicators
demand response	Zhang Ruhua[3] et al. (2022)	Stability, Coverage, Reliability
	Sheng Siqing[4] et al. (2022)	User comprehensive satisfaction, load demand response
	Wang Haibo[5] (2022)	Response power, response rate, response utility
	Liang Haiwen[6] et al. (2020)	Reliability benefits, user-side benefits
	Sun Min[7] et al. (2017)	Effect evaluation, user economic benefits, power grid economic benefits, environmental benefits
	Ju Liwei[8] (2017)	Resource utilization benefits, improving power supply reliability, and driving social development benefits
	Zeng Bo[9] et al. (2017)	Power supply quality, reliability, economic benefit, economic cost, service quality, environmental benefit
Business Support	Liu Ye et al. (2020)	Social responsibility, innovation capability, product/service quality, cost, reliability, security, confidentiality, controllability, integrity
	Yin Zeming[10] (2008)	Business capability coverage, network protocol support rate, business requirement satisfaction rate, open interface protocol support rate, service provision system capacity, standardization degree, modeling degree, openness degree, usability, reliability, awareness, functionality, integrity
	Chang Shuaiqu (2018)	Business contribution, participation, development concentration, and development balance
data supply	Liu Na (2023)	Basic capabilities for big data development: data collection level, data processing and computing level, data governance level, new technology application
		Big data sharing and opening: data resource aggregation level, data resource sharing service level, data resource openness level
		Innovative applications of big data: Converged applications, innovative applications
		Big Data Security: Work Management Mechanism, Technical Guarantee Measures
Coverage	Xiao Chuanhao (2019)	Population coverage, service coverage, cost coverage
generalization ability	Liu Hao (2016)	Site indicators, line indicators, resource allocation indicators, demand indicators
Promote application	Liu Yujie et al. (2022)	Technology application promotion, economic benefits, social benefits, environmental benefits
	He Lin et al. (2021)	Promotion scale, promotion balance, charging facilities construction, supporting support policies, industry management policies
	Liu Jianing et al. (2009)	Environmental protection, economy, fuel security, technology

3 Determination of index weight and construction of evaluation index system

3.1 Determination of evaluation indicators and weights

Through the actual application of power data empowering digital government construction and the collection of relevant literature indicators, the performance evaluation indicators of power data empowering digital government capacity building are determined, as shown in Table 2. When evaluating the current application of power data enabling digital government capacity building, the evaluation angle that can be objectively carried out is small, and the application process of power data is often that users or institutions can directly feel the convenience of data use. The determination adopts the subjective and objective weighting method, that is, the literature research method and the Delphi method to carry out index weighting on the application status evaluation indicators of the power data empowerment digital government capacity building.

Table 2. Evaluation indicators and their meanings

Level 1 indicators	Level 1 index weight	Secondary indicators	Secondary index weight	Indicator meaning
demand response	0.24	reliability	0.13	Measure the reliability and accuracy of electricity data for digital government decision-making and planning.
		real-time	0.20	Measure whether electricity data can provide timely updated information for digital government.
		availability	0.19	Measure the accessibility and usability of power data.
		safety	0.15	Measure the confidentiality and security of power data.
		ease of use	0.12	Measures how easy power data is to use and read.
		Persistent	0.1	The data will be provided to the government long-term in the future to support continuous decision-making and policy implementation needs
		professional	0.11	Measure whether electricity data is collected, managed and processed by qualified personnel to ensure high quality and professional data support.
Business Support	0.20	power enhanced	0.20	Measuring the extent to which electricity data enhances digital government decision-making and planning capabilities.
		innovative application	0.19	The degree of support provided by power data in digital government business innovation and transformation and upgrading.
		to raise efficiency	0.15	Measuring the degree to which electricity data improves the efficiency of

				digital government business processes.
		Service Quality	0.13	Measuring information exchange and service quality between electricity data and digital government.
		Industry collaboration	0.1	Measure the extent to which electricity data supports the promotion of collaborative cooperation and coordination mechanisms among various departments and industries of digital government.
		Performance Benefit	0.11	Measure the contribution and benefit of power data empowerment digital government.
		customer satisfaction	0.12	Measure government users' satisfaction with power data empowerment and recognition of its business value.
data supply	0.19	data integrity	0.13	Measures the accuracy, completeness and consistency of electricity data provided to the government.
		Data credibility	0.20	Measure whether the source of power data is credible, and whether there are errors or loopholes in the process of data release, sharing and exchange.
		Data timeliness	0.19	Whether the power data is updated in time and can meet the needs of the digital government in different time periods.
		Data Accuracy	0.15	Measuring Numerical Accuracy of Power Data。
		data standardization	0.12	Measure whether the power data complies with the existing industry and government standards and regulations.
		data interoperability	0.1	To measure whether the power data can be shared by different government departments and agencies, and whether the interfaces of different platforms are compatible with each other.
		data visualization	0.11	Measure whether power data can be presented through visualization tools.
Coverage	0.15	data source	0.20	Whether there are many types of power data sources.
		Industry Coverage	0.19	Power data for the breadth of industry coverage digital government serves.
		Regional coverage	0.15	The breadth of the area covered by the electricity data, from the country to the provinces, cities, counties, and villages, is comprehensive.

		Information dissemination	0.13	Whether it is possible to more accurately publicize and promote relevant information such as relevant policies and regulations, high-quality services, and industry news to all sectors of society.
		Application range	0.1	Power data is widely used in different business scenarios of digital government.
		User needs	0.11	Whether the digital government meets various user needs for the coverage of power data.
		Industry Impact	0.12	Whether the digital government industry economy empowered by power data has a positive impact.
generalization ability	0.12	data abstraction	0.2	Whether it has a certain degree of abstraction can be applied to different levels of city or government applications.
		universality	0.25	Whether power data can be extended to other similar fields and business scenarios.
		reusability	0.15	Whether the power data can be reused in multiple project processes in the future.
		independence	0.2	Whether the power data is independent of a single application system, and platform-independent data transfer and sharing can be performed, avoiding data lock and dependency problems.
		adaptability	0.2	Whether power data can be migrated to other applications on demand through standardized interfaces
Promote application	0.10	The actual effect of solving the problem	0.3	Whether it has improved the level of government decision-making and management, and solved practical and urgent problems.
		User Acceptance and Engagement	0.2	The promotion and application of power data empowering digital government requires extensive user support and participation, and whether the degree of user participation and satisfaction is strong.
		Applied Innovation and Technological Advancement	0.26	Whether the level of technology used and the degree of application innovation are of high standard and high level.
		Sustainability	0.24	Whether the popularization and application of electric power data has the ability of sustainable development

3.2 Evaluation method of power data application status

Standardize the index values at each level: the power coefficient method

$$x'_{ij} = c + \frac{x_{ij} - m'_j}{M'_j - m'_j} \times \mathrm{d} \qquad (1)$$

In the formula, M, m; respectively represent the satisfactory value and the unacceptable value of x, c, d are known values (given directly according to actual conditions), and the function of c is to "translate" the converted value, the role of d is to "enlarge" or "shrink" the transformed value.

Features: It can be used as a very common extreme value processing method. The range of the average value is very certain, the maximum value is c+d, and the minimum value is c. Usually, c=0.6 and d=0.4 (empirical values).

The weighted method is used to comprehensively evaluate the indicators at each level, and the scoring formula is as follows:

$$E = \sum_{i=1}^{n} A_j \ (j = 1,\ \ 2,\ \ 3 \ldots n) \qquad (2)$$

Among them: E is the overall evaluation score of the application status of electric power data, Aj is the evaluation result of the first-level index, Wj is the global weight value of the second-level index, the weight sum of all indicators is 1, and Mj is the standard of the second-level index data after data processing Performance value, n is the number of indicators in the secondary indicators.

4 Summary

In order to further promote the application of power data technology in government governance and provide tools for related evaluations, this paper constructs a government capability performance evaluation index system based on power data applications. First, through the analysis of the process and objectives of power data enabling digital government capacity building, all indicators related to the evaluation objectives are extracted from the five aspects of demand response, business support, data supply, coverage and widening capabilities, and promotion and application, and the evaluation of evaluation indicators And screening is based on repeated comparison and induction of all relevant indicators, considering the availability and accuracy of indicator data, completing the hierarchical decomposition and system construction of indicators, and finally using the literature review method and Delphi method to evaluate Indicator weighting for digital government capacity building implementation. The weights of different indicators will be determined, and finally a complete evaluation index system will be established. This paper will provide a measurable evaluation tool for evaluating how power data can improve government capabilities, deepen theoretical research on government governance, and promote the practical application of power data in improving government governance.

Project Funding Information

8117L0230001

Reference

1. Liu Mengjuan, Qin Fang. Evaluation of Government Service Quality in the Context of Digital Government: Taking Zhejiang Province as an Example [J]. Standard Science, 2023 (05): 103-110
2. Wang Peng, Sun Deliang, Jin Rao Yiqi. Research on the Construction and Strategy of Public Value Evaluation System for Digital Government [J]. Digital Economy, 2023 (Z1): 22-28. DOI: 10.19609/j.cnki.cn10-1255/f.2023.z1.011
3. Zhang Ruhua, Zhao Bing. Research on the Construction and Measurement of Demand Responsive Bus Operation Service Level Indicator System [J]. Journal of Chongqing Jiaotong University (Natural Science Edition), 2022, 41 (11): 41-51
4. Sheng Siqing, Zhang Jiaxin, Li Ran, et al. Multi energy collaborative optimization scheduling of comprehensive energy systems considering comprehensive demand response [J]. Power Automation Equipment, 2023,43 (06): 1-9. DOI: 10.16081/j. epae.202208008
5. Wang Haibo The Supply Demand Interactive Scheduling Strategy Considering the Potential Response of Short Process Demand in Steel Production [D]. Shandong University, 2022. DOI: 10.27272/d.cnki.gshdu.2022.001985
6. Liang Haiwen, Yang Liqin, Shen Li. Comprehensive evaluation index system and case analysis of public building demand response [J]. Building Thermal Energy Ventilation and Air Conditioning, 2020,39 (05): 102-105
7. Sun Min, Li Tingting, Zeng Wei, et al. Evaluation of demand response project planning based on grey comprehensive evaluation method [J]. Journal of Power Systems and Automation, 2017,29 (12): 97-106
8. Ju Liwei Research on Demand Response Participation in Clean Energy Integrated Consumption and Benefit Evaluation Model [D]. North China Electric Power University (Beijing), 2017
9. Wu Geng, Zeng Bo, Li Ran, et al. Research on the Application Mode of Blockchain Technology in Comprehensive Demand Side Response Resource Trading [J]. Journal of China Electrical Engineering, 2017,37 (13): 3717-3728. DOI: 10.13334/j.0258-8013. pcsee170284
10. Yin Zeming Research on Several Key Issues of Telecom Service Provision Based on Service Composition and Supporting Service Quality Perception [D]. Beijing University of Posts and Telecommunications, 2008