Digital Transformation and Development of Provincial Power Grid Enterprises

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ABSTRACT
The important role of power grid companies in national economic development is becoming more and more prominent, and their development level is closely related to the national economy and people's livelihood. Policies such as "digitalization" and "smart grid construction" have played a key role in promoting the transformation and upgrading of the power grid industry. To this end, this article proposes the digital transformation and development of provincial power grid companies, with the purpose of promoting the transformation and upgrading of power grid companies through research. This article mainly uses questionnaire survey and statistical analysis to analyze the attitudes of the people participating in the survey on the digital transformation of the provincial power grid, and describes its development path through corresponding research. The survey results show that 60% of people have great expectations for the digital transformation of the power grid. This popular support is urging the development of enterprises.

Keywords: *Provincial Power Grids, Power Grid Companies, Digital Transformation, Development Research*

1. INTRODUCTION

With the continuous development of power grid companies, digital construction in various regions has become an inevitable trend. At present, all provinces and cities in our country have their own different power grid engineering projects. Under the vigorous promotion of the state, basic requirements such as a unified national power system information exchange and resource sharing platform, and regional networking standard interfaces have been put forward. In order to improve the safe and stable operation of the power supply network and reduce energy loss, it is necessary to further strengthen the intelligent management and control of the power grid. Therefore, the digital transformation of provincial power grid enterprises is required.

There are not a few researches. For example, Liu Suwei said that more and more energy companies are shifting their value creation core from providing energy products to providing energy services, and the core of energy services is data services or data application services [1]. Lin Kequan clearly emphasized the requirements of building a "digital network", and obtained a new experience of cooperation with energy development through the digital transformation of "full elements, full services, and full processes" [2]. Shen Zhaoxin introduced the strategy and path of digital transformation and enterprise upgrade [3]. Therefore, the purpose of this article to study the digital transformation and development of power grids is to promote new changes in power grid companies, adapt to the times, and thus promote economic development.

This article first studies the composition of provincial power grid companies, and describes their business, production and operation characteristics. Secondly, it analyzes the implementation strategy of the digital transformation and upgrading of the power grid. Then researched the mode of power grid development in digital transformation and upgrading. Finally, the digital development of the power grid was researched through a questionnaire survey, and corresponding conclusions were drawn.

2. DIGITAL TRANSFORMATION AND DEVELOPMENT OF PROVINCIAL POWER GRID COMPANIES

2.1 The Composition of Provincial Power Grid Enterprises

(1) Commercial content of State Grid Corporation of China

The main activities of the State Grid Corporation of China include: First, the construction and operation of the power grid as the main body, and the unified deployment of its responsible power grid in accordance with the law and planning. The second is to operate the service business of purchasing electricity inside and outside the province, operating cross-grid electricity,

and electricity trading. Third, establish and operate energy projects [4].

(2) Characteristics of production and operation of provincial power grid enterprises

Does not store electrical energy: For general mechanical engineering, product manufacturing and sales require multiple connections. However, due to the nature of electrical energy cannot be stored for a long time, the process of generating and selling electrical energy is carried out and completed at the same time.

The safety requirements of electric energy products are very high. Especially some electrical equipment that cannot interrupt the power supply. Grid operators must plan and set up power transmission in a unified manner, and implement unified quality standards to ensure the safety of electricity use. Therefore, for grid companies, the reliability and safety of grid operation must be considered first, and then economic benefits.

As we all know, the product of the grid business is a single product of electric energy. According to the implementation conditions of ABC, such companies are not suitable to use ABC. However, after in-depth analysis, power grid business products are not a one-size-fits-all product. It is divided into household appliances, agricultural electrical products, industrial and commercial electrical products, water pump electrical products and other types, and can even be further subdivided [5-6].

2.2 Implementation Strategies for Digital Transformation and Upgrading

The implementation strategy of digital transformation and upgrading is the general charter for the transformation and upgrading of provincial power grid enterprises. Only when there is a scientific theoretical basis and feasibility at the strategic level, can the follow-up specific work be carried out scientifically and rationally.

The core of the digital transformation and upgrading of provincial power grid companies lies in the construction of digital software systems. Whether power grid companies can integrate the digital grid industry chain and enhance their role and value in the industry chain, the core lies in whether the digital software system is built or not. For the three types of provincial power grid enterprises with different degrees, the priority of software system construction should be different [7-8].

In the power grid, what is most needed is to clean up the data. How data technology is used in the power grid, as shown in Figure 1:

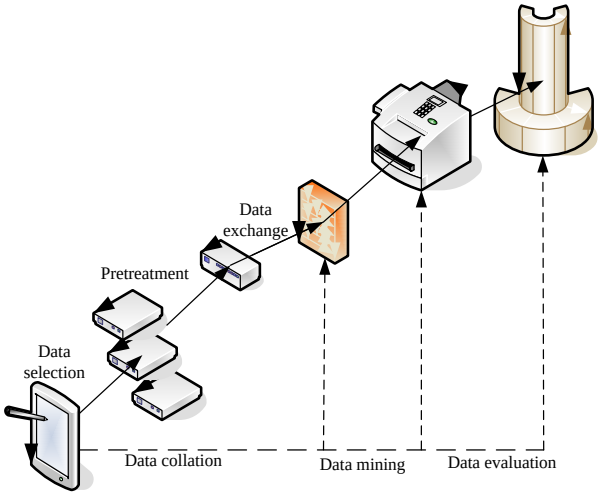

Figure 1. Data Technology Process

Due to various reasons, data may be missing. The moving average method is often used to achieve data repair. This method is to find the arithmetic average based on historical data, and use this data as a predicted value for subsequent periods. The formula is:

$$g = \sum a / m \quad (1)$$

Among them: g is the predicted number, and m is used to calculate the moving average of historical data, that is, the length of time of the movement.

With the further expansion of the power grid, the number of alarm messages is also increasing, and the alarm information presented to the dispatcher is also more complicated. The important purpose of denoising power grid alarm information is to quickly and accurately eliminate noise data, laying a foundation for further extracting useful power grid alarm knowledge, and reducing the workload of dispatchers [9-10].

Among the commonly used noise reduction methods, this paper selects the C4.5 decision tree algorithm. It uses the method of information gain rate to select decision attributes. The calculation method of the information gain rate is as follows:

Suppose Q is the sample data set, the number of samples is q, the number of attributes is n, and let q_i be the number of samples z_i in the middle. The expected information required for classifying sample Q is:

$$I(Q) = I(q_1, q_2, ..., q_n) = -\sum_{i=1}^{n} w_i \log_2 w_i \quad (2)$$

Among them, $w_i = q_i / q$, which is the probability that a certain sample belongs to.

The content resource management system is a software system that a start-up provincial power grid

company should focus on building. Only with the content resource library of the company can the digital content resources be managed in an orderly, effective and standardized manner, and the efficiency of the content resources can be realized.

For the start-up provincial power grid companies, building their own corporate standards is the direction of development, but corporate standards can only be targeted after the digitalization work reaches a certain stage, so that the standards can truly conform to the characteristics of the company itself. Based on the standards of similar power grid companies and corresponding industry standards and national standards [11-12].

For provincial-level power grid companies that have a certain foundation and experience in digital transformation and upgrading, building their own corporate standards is the focus of standard work. Among them, format standards and management standards are the basic standards that guide the digital transformation and upgrading of enterprises. Provincial power grids The enterprise standards of enterprises should focus on the construction and improvement of these two types of standards to ensure the orderly development of digital work.

Provincial power grid companies that have carried out better digital transformation and upgrading work have already represented the advanced level of domestic power grid companies in their digital transformation and upgrading construction. Standard construction is particularly important. Only excellent working methods, The management experience and the construction model are systematically regulated in the form of standards, and only then can they play the role of overall planning and guidance in the future work. This is also the meaning of the standard work.

Provincial power grid companies with different levels of digitization have different emphasis on digital transformation and upgrading, but whether it is a provincial power grid company that has just started digitalization, a provincial power grid company with a certain foundation, or a provincial power grid company that has developed a better one, it should be Actively explore digital business models and digital talent training. The former is the guarantee for the successful profitability of provincial power grid enterprises after digital transformation and upgrading, and the latter is the source of the lasting vitality of digital transformation and upgrading.

2.3 The Mode of Power Grid Development in Digital Transformation and Upgrading

Customized mode of professional content resources: The customized mode of professional content resources has inherent development advantages. Compared with the purchase and redevelopment of content resources by technology providers and platform service providers, the unique advantage of the power grid is its professional technology and professional talents.

Information service model: Deepening the power grid information service model to meet the diverse learning needs of a broad audience is an important breakthrough for the digital transformation and upgrading of power grid companies. Many power grid companies will choose such a business model when carrying out digital transformation and upgrading.

Mobile terminal application mode: There are many types of mobile terminals. At this stage, it is more suitable to develop mobile terminal application mode based on smart phones. Because the number of mobile phone users in our country is increasing, the basic network construction is relatively complete, and mobile phone reading. The convenience advantage of fragmented reading meets the needs of fast-paced work and lifestyle. Therefore, the momentum of mobile publishing is becoming more and more rapid. There is a lot of room for development and market demand for power grid companies to develop mobile terminal application models based on mobile phones.

Mobile terminal application mode: In addition to relying on smart phones, the publishing of related application software for mobile terminal products also has great potential for development. From the perspective of the future trend of the development of digital publishing by publishing companies, mobile terminal application software with strong experience and distinctive content will be a new direction for the future development of mobile terminal application models.

Product value-added model based on content resources: The basic mode of operation of this model is to develop different types of products based on content resources. The product value-added model based on content resources is to dig deeper into content resources and develop content resources twice or even three times in a way of product value-added, extending the publishing industry chain and adding new profit points.

3. SURVEY ON THE DIGITAL TRANSFORMATION AND DEVELOPMENT OF PROVINCIAL POWER GRID COMPANIES

3.1 The Key to the Transformation and Development of Power Grid Enterprises

(1) Electric power companies urgently need a new operating structure and business model

(2) Cultivate the data literacy of enterprises and employees, cultivate digital culture, change culture,

build a talent team for digital transformation, and support the goal of digital transformation of the enterprise.

(3) Planning, construction, and operation are integrated and managed to ensure that the transformation is always on the right track, from the final implementation of the reform vision to the realization of corporate value.

(4) Driven by business and technology, seize future opportunities.

(5) Establish a digital platform for the Internet of Everything, build a digital black earth, and support the digital transformation of business.

3.2 Questionnaire Survey Design of Provincial Power Grid Companies

Based on related research and investigations, and related knowledge of power grid companies, this paper designs a questionnaire for the digital transformation of provincial power grid companies. In the questionnaire, the center is the transformation of power grid companies. The development of the problem mainly revolves around the following aspects:

(1) Problems existing in power grid companies

(2) The difference between the provincial power grid and the national power grid

(3) Transformation direction of provincial power grid

(4) Pathways for the digital transformation of provincial power grids

(5) Recognition of digital development of provincial power grids

3.3 Questionnaire Survey Process

Through the questionnaire design, this article first invited 20 random passers-by to answer the offline questionnaire. Then filter and reorganize its problems. After that, citizens are invited to answer questions online. A total of 200 citizens were invited to conduct the survey. The questionnaire lasted for a week. One week after the questionnaire was issued, the online questionnaire was collected and data sorted.

4. ANALYSIS OF THE RESULTS OF THE QUESTIONNAIRE

4.1 Digital Development of Provincial Power Grids

According to the results of the questionnaire survey, the key points of the digital development of the provincial power grid are the new operation structure, the data literacy of the employees, the design of the digital platform, and the overall management. Citizens have different key attitudes towards these four developments. The details are shown in Table 1:

Table 1. Digital Development of the Primary Power Grid

	Agree	Generally	Disagree
New operation	25	12	5
Data literacy	30	18	4
Digital platform	35	14	5
Overall management	30	16	6

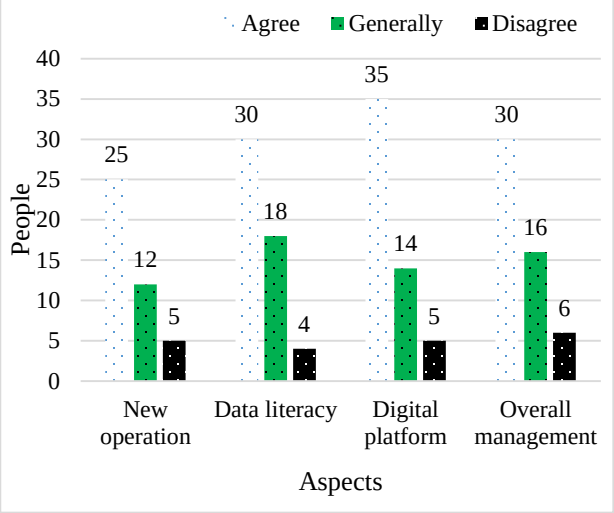

Figure 2. Digital Development of the Primary Power Grid

As shown in Figure 2, we can see that most people still agree with the digital transformation and development of the power grid, which shows that the digital development of the power grid is what the people want. In addition, some people have a general attitude towards this. This shows that there is a need to strengthen publicity for the development of digital power grids.

5. CONCLUSION

In order to meet the needs of the country and its own development, power grid companies actively carry out digital transformation to meet the higher requirements of modern society on the power system and power supply quality. The digital transformation of power grid companies is a national strategy and a phenomenon that must appear in the process of economic development. The digital construction of power grid enterprises is a crucial step in the development of our country's power industry. It can not only improve the country's energy utilization efficiency, but also promote social and economic growth. According to the results of the

questionnaire survey, people have great expectations for the digital development of the power grid.

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