Research on the current status and transformation strategy of digitalization at the State Grid Jibei Electric Power Company

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Abstract: Developing the digital economy and promoting the digital transformation of enterprises has been an important direction for the development of enterprises in various countries. This article systematically analyzes the information organization, communication network, digital platform, business application system, information security and information operation and maintenance status of the company in Jibei Electric Power Company. Based on the analysis of the development environment and advantages and disadvantages of digital transformation in Jibei Electric Power Company, the development strategy of establishing unified digital development committee, improving the digitalization ability of power transmission and distribution business, improving the digitalization capability of internal operation and building the toB terminal service platform of integrated energy services are put forward.

1. Introduction
In recent years, the rapid development of digital economy, supported by advanced technologies such as cloud computing, big data technology, Internet of things, mobile Internet, artificial intelligence and Internet business mode, has provided tremendous momentum for economic and social progress. The digital transformation of traditional industries has been concerned by governments, enterprises and many other areas[1-2]. In China, the government has proposed to speed up the deep integration of big data and the real economy, speed up scientific and technological innovation, and develop the policy of "Digital China". Digitalization has gradually become an important engine for China's development[3-4]. Under the background of digital transformation and development, Jibei Electric Power Company, as an important public service enterprise of State Grid, is in charge of the power supply business in northern Hebei and the power supply security in Beijing, supporting the coordinated development of the Beijing, Tianjin and Hebei[5]. How to carry out digital transformation, enhance the company's competitiveness, and better serve the economy and people's livelihood development has become an important issue for the company's development.

Researchers have carried out a lot of research and practice on the digital transformation of enterprises. The quality of enterprise digital transformation depends on the effectiveness of human resource management in innovative enterprises[6]. In the process of digital transformation, digital technology will optimize the enterprise business model, and the enterprise business process is changing from physical products to data driven services[7-8]. As a mature application in the field of artificial intelligence, the application of Robotic Process Automation in financial business can reduce the transactional work of financial personnel and improve the efficiency of financial analysis[9]. APM
(Application performance management) technology can be used for real-time monitoring of enterprise systems to achieve enterprise equipment performance management and reduce enterprise operating costs[10]. Building the digital platform of enterprise and integrating quality management system and general management system can promote quality management of enterprise[11]. In the process of enterprise digital transformation, it is necessary to pay attention to the management of enterprise system structure, as well as market trends and strategic management[12-13]. Enterprise digitalization has become the focus in the race for corporate growth [14-15].

This article systematically analyzes the situation of the Information Department of Jibei Electric Power Company, as well as the status of the company's network, platform, business application, information security and information operation and maintenance. In addition, this article analyzes in detail the development strategy of digital China, power market reform and "Internet plus" smart energy, as well as the development of comprehensive energy business, At the same time, it also puts forward the national strategic development environment in which Jibei Electric Power Company's digital development is located, such as the low-carbon Olympics and the coordinated development of the Beijing, Tianjin and Hebei, as well as the industry reform environment and regional development environment. Then, based on this, this article proposes the advantages, disadvantages, opportunities and threats of the digital transformation development of Jibei Electric Power Company. Finally, based on the development environment of Jibei Electric Power Company and its own situation, this article provides strategic suggestions for the digitalization of power industry.

2. Analysis of Company Digitalization Status

2.1 Company Information Department Organization

The informatization work of Jibei Electric Power Company is an important support for the company's operation and management. The informatization leadership group is the leading and decision-making body of the company informatization work, and is responsible for implementing the decision of informatization work of the State Grid. The company's Internet department is the information management department. It is responsible for managing the business needs summarized by all units of the company, and in charge of the department's business needs and project construction. Meanwhile, it coordinates the digital transformation work of all departments of the company. Other departments of the company headquarters, municipal companies, directly affiliated the municipal companies, and directly affiliated units shall be responsible for the business needs and project construction of their own departments.

Jibei communication branch is mainly responsible for the construction, scheduling, operation, maintenance and customer service of the communication system, and delivers technical support and guidance on the operation and maintenance of the information and communications system at all the units under the Jibei Electric Power Company. More than 2,000 people are involved in the company's informatization, accounting for more than 15% of the company's total personnel.

The company has established a perfect information decision-making, management, implementation, operation and maintenance organization system. The large number of employees related to informatization provides sufficient organization and human resources guarantee for informatization construction and development.

| Department                                      | Responsibility                                      |
|------------------------------------------------|----------------------------------------------------|
| Corporate Informatization Leading Group         | Leadership and decision-making body                |
| Corporate Internet Department                   | Informatization work management department          |
| Other departments of the corporate headquarters | Responsible for department business needs, project construction |
| Corporate City Company, Directly Affiliated Units | Responsible for own business needs, project construction |
2.2 Company Network Layer Status
In order to grasp the operation status of the company's power equipment, grasp power consumption and new demand of the company's power users, realize the dispatch and operation of the company's transmission and distribution equipment, realize the intercommunication of production, operation, operation information and business between the county-level power supply company, the city-level power supply company, the directly affiliated units and the company's headquarters, and at the same time realize the intercommunication of production, operation, operation information and business with the headquarters of the State Grid, Jibei Electric Power Company has established an internal secondary information network between the county power supply company and the city power supply company with the directly affiliated unit and the company headquarters. Meanwhile, the interactive network between the headquarters of the company and the headquarters of the State Grid has been established so as to realize the information exchange between the internal and external connections of the company. In addition, the company has established a high-speed information interaction channel covering the company's internal units as well as the company and the headquarters, ensuring the high-speed and reliable transmission and interaction of information.

![Figure 1. Schematic diagram of company network connection](image)

2.3 Company Platform Layer Status
The company has built a digital platform architecture consisting of data platform, system components and basic resources, providing basic data storage computing resources and application environment for the company. The data platform is composed of basic resources and a full-service unified data center.

![Figure 2. Platform Architecture](image)
Basic resources provide server resources, storage resources and platform software resources, and set up various business data standards such as operation and management. According to standards, the full-service data center provides big data services such as unified storage, access, processing, and analysis of multidimensional data like structured, unstructured and semi-structured data. System components are composed of application development components and integrated management components, so as to provide integration and development services such as data, application, process and interface for the application system. Access channels include enterprise portals, mobile application platform components, and visual platform components, it provides multi-terminal and multi-channel access services for the integrated business application system. Meanwhile, the company is developing the middle platform strategy, and now it has basically built the data middle platform. Thus, it improves the company's data fusion and sharing ability and improves the level of business digitization.

2.4 Company Business Application Status

In order to ensure the rapid implementation of various departments' businesses, the company has built 10 kinds of business systems, including human resource management, financial management, material management, planning management, project management, operation management, production management, marketing management, collaborative office and comprehensive management. It comprehensively covers the relevant business of the "three sets of five major" management system, and six links of smart grid power generation, transmission, transformation, distribution, power consumption and dispatching. In addition, it constructs intelligent analysis and decision application for the company's production operation, operation management and marketing services, to achieve comprehensive coverage of the main application systems within the company. The schematic diagram of its business application architecture is shown in Figure 4. It provides information support for the company's production and operation, comprehensive management and other business.

![Figure 3. Corporate Business Applications](image)

2.5 Information Security

The company earnestly implements the "network security law" regulations, carries out the network security requirements of the State Grid, and deepens the active defense system of information external network security. At the same time, the company has strengthened the security protection and anti-leakage protection of business data, application data and personal information data, and accelerated the construction of a multi-dimensional security protection system for information internal network. In addition, the company has put the top-level design of information security into practice, and comprehensively forge an information security defense system that is "manageable and controllable, precise in protection; intelligible and reliable, smart in defense." By deepening the panoramic visual early warning and monitoring, strengthening the security of intelligent terminals and
wireless network, and improving the leakage prevention measures of sensitive data, the company has realized the coordinated linkage of information security infrastructure. Meanwhile, the company deepens the security of big data, cloud computing, Internet of things and mobile Internet technologies, and actively promotes the protection scheme of intelligent and controllable new-generation security technologies. At present, the company has established a comprehensive information security system, and accelerate the application of intelligent security protection technology.

2.6 Operation and Maintenance
Oriented by value services, the company has improved the information operation and maintenance organization system and optimized the operation and maintenance process. In addition, the company has improved the standard of the informatization operation and maintenance system, strengthens the responsibility supervision, and deepened the risk prevention and the management of hidden dangers. The company has comprehensively improved its core capabilities such as scientific information control, lean operation inspection, and agile services, and strengthened the whole-process control of operation mode, and strengthened the online and offline management of information equipment systems. By deepening the business application of intelligent dispatching and inspection, upgrading business monitoring tools, promoting automated operation and maintenance tools, and building an audit platform for the whole process of operation and maintenance, the company has realized "intensive management, lean operation, intelligent handling, and agile service". Therefore, at the present stage, the company has established a complete information operation and maintenance management system, and established a complete and efficient operation and maintenance tool system.

3. Analysis of Company Development Environment and Development Trend

3.1 Development Environment Analysis

3.1.1 Digital China Development Strategy.
China attaches great importance to the construction of digital economy and digital infrastructure. In 2017, General Secretary Xi Jinping pointed out that China should insist on the supply side structural reform as the main line, speed up the development of digital economy, promote the development of the real economy and digital economic integration, and continue to do a good job in informatization and industrialization depth fusion. He stressed that China should use data as an important means of production, and use big data to guide the rapid optimal allocation and regeneration of resources, so as to promote high-quality economic development. In 2020, the Standing Committee of the CPC Central Committee proposed to speed up the construction of new infrastructure such as 5G networks and data centers. Moreover, the digital transformation of energy industry meets the requirements of national strategic development. It can be seen that China attaches great importance to data management and its role in production and operation, and actively explores the optimal allocation and regeneration of resources through digital economy.

3.1.2 Electricity Market Reform and "Internet +" Smart Energy Development.
Since 2015, China launched the second electricity market reform, proceeded effective competition on the power generation side and the power sales side, actively carried out power demand side management and energy efficiency management, and promoted economic restructuring, energy conservation, emission reduction and industrial upgrading. Moreover, this reform has strengthened scientific and technological innovation in the energy sector, promoted the transformation of the power industry into development competition and refined development methods, optimized the structure of energy development and use, improved the development quality and efficiency of the power energy industry, and helped economic development.

In 2016, the National Energy Administration of China issued guidance on promoting the development of "Internet +" smart energy, and actively promoted the deep integration of Internet
concepts, advanced information technology and the energy industry. Through the innovation of new technology and new business model of energy Internet, it will promote the digital transformation and development of energy industry.

3.1.3 Digital Transformation and Development of Integrated Energy Business. Integrated energy business has become a new growth point in China's energy industry. Since 2017, the State Grid has entered the comprehensive energy service industry, providing multi-energy operation services and investment and financing services. Through the new strategy of energy Internet, the company builds a smart energy system featuring ubiquitous interconnection, efficient interaction and intelligent development, so as to provide users with diversified energy services and promote the development of comprehensive energy business. ENN Group focuses on cross-disciplinary integration of energy technology and information technology, Internet of Things technology, big data and artificial intelligence, creating a pan-energy network platform, focusing on energy-consuming enterprises, using data intelligence to promote substantial energy efficiency improvements, and promoting comprehensive energy business development. Major Chinese energy enterprises such as State Power Investment group, China Huadian group and Zhejiang Energy group have also found a new growth point in digitally promoting the development of comprehensive energy businesses and innovated energy service commodities.

3.1.4 Low Carbon Olympic. The 2022 Beijing Winter Olympics will be jointly held in Beijing and Zhangjiakou which is the power supply service area of Jibe Electric Power Company. The Beijing Winter Olympics actively advocates a low-carbon lifestyle of the whole society, promotes the demonstration of low-carbon technology applications, and conducts international cooperation in an effort to make the Beijing Winter Olympics an important platform and window for China to show its participants, contributors, and leaders in the construction of global ecological civilization. The Beijing winter Olympic Games will use low-carbon energy to build low-carbon venues and transport systems. Moreover, the Beijing Winter Olympics encourages companies involved in the Olympic Games to donate emission quotas to create the "Beijing Case" of the carbon GSP for the Olympic Games.

3.1.5 Coordinated Development of Beijing-Tianjin-Hebei region. To promote regional development, China has formulated a coordinated development strategy of Beijing Tianjin Hebei. The core of the strategy is to develop them together as a whole, adjusting and optimizing the urban layout and spatial structure, building a modern transportation network system, and expanding the environmental capacity and ecological space. Through the construction of a green and sustainable human settlement environment, seeking the coordinated development and layout of the urban system, regional space, and major infrastructure, promoting industrial upgrading and transfer, and promoting the joint construction and sharing of public services such as energy supply, Beijing-Tianjin-Hebei region can achieve the coordinated and innovation-driven development and promote institutional innovation in regional development. Finally, a new type of capital economic circle oriented to the future will be created, so as to form a new pattern of coordinated development in which the Beijing-Tianjin-Hebei region will draw on each other's strengths and achieve mutual benefit and win-win results.

3.2 Development Trend Analysis

3.2.1 Advantages. In terms of information infrastructure, the company has established an information transmission and interactive network covering all units and departments of the company, and has established platform infrastructure that support the company's operation, management data storage, as well as the development and access of various business applications. In addition, it also has established a
complete information security protection system for internal and external network, and operation and maintenance system. In terms of business integration, the company's production, operation and management departments have realized the support of information system coverage, and carried out the analysis and decision-making application construction and application of production operation, operation management and marketing services. Through the information system, the company's business implementation is fast and convenient. At the same time, the company's data analysis capabilities promoted. In terms of human resources, the company has established a complete informatization development supporting organization system. Informatization construction, management, operation and maintenance organization systems are sound, and informatization human resources are sufficient.

3.2.2 Disadvantages.
Regarding business development, as a public service unit for power transmission and distribution, the core business of the company is to ensure the safety of power transmission and distribution, meet the power demand of users and reduce the loss of power transmission and distribution network. Besides, the information system serves the business development and implementation, and the information work isn’t the core business of the company. At present, the company has not realized business process reengineering and model transformation through digital technology. Meanwhile, the company's integrated energy service business is still in its infancy, and the degree of business development and digital integration is still low.

On the point of technology application, due to the insufficient degree of data fusion and sharing in the company, the supporting capacity of data for business development is limited. Moreover, the company's ability to combine business with data has just started, and no unified development model has been formed.

As for human resources, the existing informatization professionals belong to the informatization construction, management, operation and maintenance personnel, and are not involved in the development of the company's core business. In addition, the company lacks digital core talents, and the Internet department supporting the business and digital integration of the company is a secondary department, which cannot fully mobilize the company's development resources.

3.2.3 Opportunity.
The digital transformation of the company faces multiple opportunities such as national strategy, industrial transformation and regional driving. Driven by the national strategy, the government and industrial enterprises are carrying out digital transformation. Therefore, with the increasing demand of the government and enterprises for the application of power data, the market demand is gradually expanding, which provides a broad data operation opportunity for the company's digitization.

Driven by the transformation of the industry, integrated energy service has become a new growth point of the energy industry. The integrated energy business model has become clearer, the emphasis on improving comprehensive energy efficiency has increased, the demand for refined operation of the power demand side has grown, and the digital products of electricity industry have increased.

Driven by the region, the demand for clean energy and energy interconnection in the Jibei region is increasing, and the coordinated development of the Beijing, Tianjin and Hebei has raised the demand for smart energy infrastructure. These opportunities provide new energy smart markets for the company's digital transformation.

At the same time, enterprises need to continuously increase the level of digitalization in order to improve operational efficiency.

3.2.4 Threats.
Under the background of digital transformation and rapid development of integrated energy business, the competition of power data operation and integrated energy service market is increasingly fierce. In the company's operating areas, State Power Investment group and ENN group are vigorously
developing digital energy products in order to compete for the digital energy market. Thus it can be seen that the digital market of energy and power is highly competitive. The development of digital market competition also brings the risk of brain drain to the company.

4. Connotation and Strategy of Company's Digital Transformation

4.1 The Connotation of Digital Transformation
The connotation of digital transformation of Jibei Electric Power Company is mainly embodied in organizational management, technology and business model. In terms of organization and management, the company establishes a data management department to realize unified management of company data, and strengthens the organization and coordination ability of digital department. Then, the company drives the business through data to improve the response speed of employees, so as to better manage the company's business and improve the management efficiency of the company. In the field of technology, the company strengthens the combination of digital technology and business application to realize data sharing, and makes data and business processes fully observable. In terms of business model, through the reform of digital technology and management mode, the company can optimize the business process of power transmission and distribution, improve the automation degree of power transmission and distribution process, provide users with electricity experience, and provide effective support for the integrated energy service business. Furthermore, it provides support for the development of enterprises and governments by innovating the business model of integrated energy services, expanding the digital business of integrated energy services, and optimizing the supply chain of the company's power transmission and distribution business and integrated energy service business.

4.2 Digital Transformation Strategy

4.2.1 Establish a Unified Digital Development Committee.
In the process of digital transformation, Jibei Electric Power Company mainly faces two challenges, including data becoming an important means of production, and business process transforming through digital technology. At present, the company's information management department belongs to the company's second-level department. Its main responsibility is to complete the company's information planning and coordinate the implementation of the company's various departments' information projects. Moreover, the company does not have unified data operations or the ability to deeply integrate digital technology.

Facing the digital transformation of the company, it is necessary to set up a digital development committee at the company level to make a unified layout of the company's data operation and digital technology application. The digital development committee is composed of the chairman of the company, the deputy general manager in charge of informatization, and the business departments and directly affiliated units of the company. The committee is mainly responsible for unifying corporate data specifications and establishing uniform methods and rules for data operation. The digital development committee has an executive office, which is headed by the head of the company's Internet department. The office is responsible for implementing the company's digital development strategy, coordinating the needs of various business departments and directly affiliated units, sorting out the problems in the company's digital transformation, and then solving them together with the digital development committee.

4.2.2 Improve Digital Integration of Power Transmission and Distribution Business.
The transmission and distribution business of Jibei Electric Power Company mainly consists of transmission and distribution dispatching, equipment operation and maintenance. In the dispatching business, the emphasis is to strengthen the data standard integration of dispatching data, establish the dispatching business data label, and establish a perfect and convenient power dispatching data analysis and application system. Then, it further connects meteorological, industrial output and consumption
data with government data to improve the accuracy of new energy and load forecasting. In the process of power dispatching, machine learning is used to build a knowledge base of dispatching artificial intelligence, so as to improve the dispatching operation efficiency.

In the operation and maintenance business, the focus is to improve the equipment operation label database, and improve the equipment operation status analysis ability. In addition, augmented reality technology is used to improve the accuracy of equipment operation and maintenance. Meanwhile, RPA technology and robot technology are applied to process operation and maintenance to improve the accuracy of business.

4.2.3 Improve the Digital Capability of Internal Operations.
In the financial management, human resource management, material management and other internal operations of Jibei Electric Power Company, there are a lot of business reporting work, which are highly repetitive and consume a lot of manpower and time. If the RPA technology is applied to the business report work, and the manual report is replaced by the business PRA, the work efficiency will be greatly improved.

By applying the data analysis technology to the company's finance, human resources and material management analysis, it can realize the real-time monitoring of the company's financial situation and financial risks, and control financial risks in advance. The digital analysis of the company's employees' work performance can quickly find the fluctuations of employees' work and identify excellent employees. Besides, by establishing a real-time monitoring system for company materials, it improves company material management and demand forecasting, and optimizes the use of company materials.

4.2.4 Build a Comprehensive Energy toB Side Service Platform.
At present, integrated energy service business has become an important competitive market for Chinese energy enterprises, and integrated energy service is transforming to data-driven and equipment service. While carrying out comprehensive energy service businesses such as comprehensive energy supply and user equipment operation and maintenance, Jibei Electric Power Company shall establish a comprehensive energy service toB terminal service and trading platform, and strengthen the mining of user energy demand data, government energy development data and user equipment data. Furthermore, data products such as user energy optimization and user equipment status analysis will be launched, and data docking and commodity docking services will be provided to various comprehensive energy service providers. Finally, it will become a business provider and establish a comprehensive energy service circle that benefits users.

5. Conclusion
Developing the digital economy and advancing the digital transformation of enterprises have become a new direction of development in China and even the world. As an electric power enterprise within the State Grid, Jibei Electric Power Company is mainly responsible for the power supply business in northern Hebei province, ensuring the power supply safety in Beijing, and at the same time carrying out the comprehensive energy service marketization business. Therefore, the digital transformation of Jibei Electric Power Company is of great significance to the development of the company and the exploration of the digital transformation of the power industry.

At present, Jibei Electric Power Company has a complete organizational system to support the development of the company's information technology, establishing the internal and external communication network of the company, and building a unified data management platform. The company's application system access channels that support company-side, mobile-side, and Internet-side access have been established, and application systems covering the company's business system have been established. However, the company is faced with disadvantages and problems as the inability of the information department to fully mobilize the company's resources and the low level of marketization of the company's digital business. Therefore, according to the current situation of Jibei Electric Power Company, this article puts forward the following digital development suggestions:
establishing a unified digital development committee, strengthening the digital transformation and promoting the implementation capacity; strengthening the application of emerging technologies such as data analysis and artificial intelligence in the power transmission and distribution business; improving financial management, human resources management and material management business process automation level, and improving internal operating digital ability; and establishing a comprehensive energy toB-side service and trading platform, and develop comprehensive energy digital services, so as to provide a reference for promoting the digital transformation of Jibei Electric Power Company and the power industry.

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