The Intelligent Extraction of Cost Analysis Data of Transmission and Transformation Project Based on Computer Technology

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Abstract. Transmission and transformation project is related to the national economy and people's livelihood, and its development and construction level is directly related to the national life happiness. The full development of computer technology has brought good news to many fields, and the construction of power transmission and transformation projects has also benefited deeply. This paper probes into the application of computer technology in the field of power transmission and transformation engineering cost analysis, points out the three difficult problems it faces, and gives the corresponding solutions.

Keywords: Computer Technology, Transmission and Transformation, Engineering Cost, Intelligence

1. Introduction
In the past, we did not pay enough attention to the cost management of power transmission and transformation projects in the process of power grid operation, which led to the frequent occurrence of funds operation and improper control, which brought great influence to the normal operation of power grid projects[1-2]. Since 2006, the State Grid Company, the Energy Bureau and the provincial power companies have strengthened the management of economic and technical research work in power transmission and transformation projects. The Ministry of Infrastructure has continuously improved the cost management methods, and has formed a unified standard for cost analysis indicators and data reporting for power transmission and transformation projects[3-4]. The aim is to standardize and standardize the statistical analysis work of power transmission and transformation projects in provincial companies, which provides a scientific basis for improving and improving the management level of power transmission and transformation projects.

The cost analysis of power transmission and transformation projects is of great significance to...
control the project cost, improve the investment benefit and strengthen the project cost management of power grid enterprises\textsuperscript{[5]}. However, since 2005, the scale of State Grid construction investment has increased year by year, the average growth rate of China's power grid investment between 2005–2011 is as high as 15.8\%, and the construction cost has also been increasing constantly, resulting in a sharp increase in the amount of data needed for statistical analysis. This big data environment undoubtedly brings greater data processing pressure to cost managers\textsuperscript{[6-7]}.

2. Application of computer technology in cost data analysis of transmission and transformation project
At present, the intelligent extraction of engineering cost data by computer technology is still in the primary application stage, only the basic functions of computer are used. According to the actual needs of the business, the platform divides the data into: substation engineering, line engineering, cable line, communication cable, communication equipment; according to the construction stage of the project divided into: initial stage, settlement stage; according to the professional division into: initial plate, settlement plate, bidding plate, material procurement plate. In the cost analysis platform, the business scope and work flow of each participating unit are agreed, and different operation interfaces are designed from the professional point of view. Each unit fills in structured data and uploads unstructured data according to their respective authority. The names and contact details of the filers are available at each interface to facilitate the implementation of the problems in the subsequent data verification. The logical relationship between the data is set up in the platform and the function of timely reminding is provided. The platform restricts the progress of information filling, the project status is divided into: the project is not completed, the project has been completed, used to identify the overall filling of the project; the data status is divided into data is not completed, data has been completed, but not submitted, data has been submitted, data has not been reviewed, need to be modified, re-submitted, identify the reporting units for the unit's business filling plate data filling progress.

3. Problems in analysis of cost data of transmission and transformation projects

3.1. The macroscopic situation of cost management system of power transmission and transformation project is changing day by day
Under the current environment of big data, the macro situation of power grid construction is constantly changing. With the improvement of national economic level, construction cost, labor cost, land requisition cost is rising. Due to the lack of digitalization, electronic data transmission and high level of information management among various departments, the historical data and quota data of project cost are difficult to follow up in time, which makes it more difficult to control part of the cost of power grid project.

3.2. It is difficult to monitor and guide the project cost in real time
The cost analysis of power transmission and transformation projects carried out by State Grid every year provides an important basis for the cost management of power grid projects. However, due to the long working cycle and the imperfect cost data database, it is difficult to monitor and guide the cost management in real time. The main difficulty is that the data required for cost analysis index is large and involves many departments, such as the final account data for completion from the financial department's final account report for completion, the main technical conditions from the preliminary
design or construction drawing design, and for the construction in progress, the material department and the capital construction department should provide the relevant information about the material or construction. In addition, the cost analysis index has a large amount of calculation, although the Bo micro software has provided the relevant functions of cost analysis, it is still difficult to automatically calculate the index in real time and display it in a unified chart form.

3.3. Work efficiency in cost analysis needs to be improved

Although the application of information system provides strong support for the cost management of power grid engineering, the work efficiency in the process of cost analysis is still low, and the phenomenon of duplication of work is very serious. The specific performance is as follows: (1) there is a large number of manual data import phenomenon, the accuracy and timeliness of information has some problems; (2) business personnel sometimes need to switch more than one system in practice to complete a work content, and there is a lot of data multiple input situation; (3) each system is based on different database and technical logic operation, so the data is inconsistent in multiple systems.

4. Application of computer technology in cost analysis data of transmission and transformation project

4.1. Application background

In order to improve the management level of power grid project cost in order to meet the great challenges brought by entering the era of smart grid, each state power grid management department combines power grid project cost management with information technology to establish and apply the platform of engineering cost information database. There are more mature systems and methods in the construction of power grid engineering cost management information platform. China's State Grid Company and provincial power companies attach great importance to the accumulation of cost information for completed projects, and have also made good achievements in the construction of power grid engineering cost analysis information platform. In order to further improve the standardized management system of capital construction, improve the lean level of capital construction cost management, optimize the investment decision-making mechanism, improve the investment decision-making ability and strengthen the cost control work, every year, China National Power Co., Ltd carry out the annual cost analysis of power transmission and transformation projects every year. Under the background of computer technology, the construction of power transmission and transformation project becomes more and more complicated, lean and standardized, and the workload of engineering cost analysis is increasing day by day. The introduction of information management platform can help to realize the storage and analysis of cost data, improve the timeliness and accuracy of cost analysis, and improve the work efficiency of technical and economic personnel.

4.2. Structured data of line engineering

The data structure of transmission line engineering is divided into structured cost analysis data and unstructured cost analysis data. The line engineering data system of each voltage grade is divided into: line engineering basic information data, line engineering technical and economic data index. The basic information data of line engineering are shown in figure 1. This part of the data mainly includes the information of construction scale of line engineering, basic conditions of design, topography and geology, participating units and so on. The technical and economic data of line engineering mainly include the construction scale of line engineering, basic design conditions and geological data indexes.
The technical and economic data (cost) of line engineering mainly include the data indexes of line engineering estimation, budget estimate, accounts and so on.

![Diagram of Basic Data Frame for Transmission and Transformation Line Engineering](image)

**Figure 1.** Basic data frame for transmission and transformation line engineering

### 4.3. Structured data of substation engineering

The substation project is divided into three categories: new construction, extension main transformer and extension interval. The data system of substation engineering of each voltage grade is divided into: basic information data of substation engineering, technical and economic data index of substation engineering, among which: basic information data of substation engineering mainly include data index of engineering construction area, construction time sequence, natural condition and so on. The technical and economic data of substation engineering mainly include substation type, construction scale, distribution type, wiring type and other data indexes. The technical and economic data of substation engineering mainly include the construction area, construction support engineering quantity, station foundation and so on. The technical and economic data of substation engineering mainly include the data indexes of substation engineering estimation, budget estimate and final account. Figure 2 shows the analysis of cost of computer output transmission and transformation project.
Figure 2. Analysis of cost of computer output transmission and transformation project

4.4. Unstructured data for transmission and transformation projects
According to the time series of the project construction, the technical and economic documents related to the research stage, the initial stage, the bidding stage and the completion stage the initial stage, the bidding stage and the completion stage. Structured data of power transmission and transformation project cost analysis is part of unstructured data conversion. With the gradual deepening of data analysis and prediction, the application of unstructured data is particularly prominent. The full collection and collation of unstructured data will lay the foundation for the subsequent construction and application of "big data ".

5. Conclusion
At present, the engineering information collection and cost analysis platform is running well, which not only meets the requirements of the cost analysis of the national network company, but also gradually establishes the intelligent extraction platform for the cost analysis of power transmission and transformation projects in various provinces and cities, and continuously improves the information level of the cost management of power transmission and transformation projects. The construction of intelligent computer technology for power transmission and transformation project cost analysis is a long-term and complex work.

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