Design of Integrated Data Analysis System of Power Network Based on J2EE

Li-Jun MAO\textsuperscript{a}, Yan ZHANG\textsuperscript{b}

Xi’an Peihua University, Xi’an, Shanxi, China
\textsuperscript{a}35909250@qq.com, \textsuperscript{b}410325568@qq.com

**Keywords:** Data Warehouse; J2EE; Data Security.

**Abstract.** The to the provincial, city power grid enterprises as the object, to the relevant national standard management, technical specification, software industry standard as the basis, large database, J2EE and other technologies, for the user to provide the reliable system environment, the powerful system function analysis. After the system is put into use, it can greatly improve the working efficiency of economic analysis staff, provide the decision makers with the operation data of enterprise operation, and provide powerful help for enterprise scientific management decision.

**Introduction**

With the deepening of the reform of China's electric power system, the reform and restructuring of the electric power industry and the acceleration of the process of power market, the content of economic activity analysis of power grid operation enterprises is more rich and complex, and the original analysis forms and means can’t meet the actual needs of analysis. Modern means must be adopted to collect and analyze data through computer software.

Based on this, we have made a comprehensive investigation on the current methods of economic activity analysis of power grid operators, and designed a "J2EE-based comprehensive data analysis system of power grid" by integrating the advantages of various analytical methods, combining the theory of economic activity analysis and the actual situation of power grid operators.

**System Requirements Analysis**

The power grid integrated data analysis system is a comprehensive analysis, economic prediction and decision support system. In the process of system design, development and implementation, we should use the most advanced development platform and tools, absorb the successful experience of economic activity analysis at home and abroad, design and develop a system that is in line with international practices and the future direction of development. Fully standardized requirements, perfect functions, practical, easy to learn, easy to use, flexible expansion, safe and reliable comprehensive economic activity analysis network system, strengthen the in-depth analysis and monitoring of the overall operation of the company, provide a basis for scientific management and decision-making of enterprises.

**System Function Analysis**

Comprehensive analysis of various methods of economic activity analysis of power grid operation enterprises, as well as the theory of economic activity analysis and the actual situation of power grid operation enterprises, should have four functions for the overall function of the software. The system function is shown in Fig. 1.

**System Management**

The system should be able to achieve comprehensive management functions, dynamically allocate system modules, privileges, etc., maintain and modify the various codes used in the system,
and set system running parameters according to actual needs. The user rights management module is shown in Fig. 2.

Figure 1. Functional Diagram of Data Analysis System.

Figure 2. User Rights Management Diagram.

**Data Acquisition**

Data acquisition is the premise and basis of analysis. To provide a comprehensive data interface, the system should be able to input data by various departments according to their own identity and authority, and directly import data from various professional databases. When the other party database is not allowed to access, it is also necessary to import data from the reported Excel form.

**Data Analysis**

Because data analysis is mainly about the analysis of various economic indicators, the design of this part first gives a functional description, and then gives its specific analysis indicators and analysis methods in tables to reflect the overall functional effect. After the system is finally formed, it also needs to analyze text and graphics.

**Data Quality Monitoring Solution**

The main functions of data quality monitoring include: data monitoring Kanban, data correction, data quality analysis and data evaluation report. Data quality monitoring takes the application of data center as the main line, supervises, controls and processes the data quality problems in the application process, and dynamically improves the data quality. When data quality problems arise, data monitoring Kanban displays early warning information. Users can find data quality problems
through data monitoring Kanban. At the same time, they can find problems through error information, correct data and re-execute ETL process to complete data quality problem processing. As shown in Fig. 3.

![Figure 3. Overall Framework of Data Quality Detection.](image)

**Prediction Analysis**

<table>
<thead>
<tr>
<th>Historical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial number</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

**Table 1. General Prediction Method Algorithm.**

<table>
<thead>
<tr>
<th>Prediction results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prediction method</td>
</tr>
<tr>
<td>Unary linear regression</td>
</tr>
<tr>
<td>Hyperbola</td>
</tr>
<tr>
<td>Gray scale method</td>
</tr>
<tr>
<td>Weighted value</td>
</tr>
</tbody>
</table>
The system uses a large number of historical data, uses a variety of forecasting methods and combines the forecasting situation of lower units to make a comprehensive forecasting of electricity sales, social electricity consumption, line loss rate, electricity purchases and average price of electricity sales. The general forecasting method is shown in Table 1.

Entering the prediction process, the abnormal historical data can be corrected, and the reasons for correction can be noted. There are three prediction algorithms, one yuan linear regression, the other is nonlinear method and gray value method. The prediction results can be revised according to the actual situation. Finally, the final prediction results can be calculated by weighting the accuracy of each method.

**Decision Support**

Decision support is the core function of the system. The ultimate purpose of all data analysis and forecasting analysis is to provide the basis for enterprise development planning and formulation of major policies and policies, to provide modern management means and scientific decision support for business management, and at the same time, the system should be able to simulate the scheme according to index prediction. Profit analysis and multi-objective dynamic analysis.

**Analysis Report**

The system should be able to generate analysis reports according to the results of analysis, and upload the analysis reports to the database, so as to provide convenience for leaders to exchange queries and analysts. Upload data is shown in Fig 4.

![Figure 4. Upload Data Report.](image)

**Power Supply Unit Analysis System**

The system should synthesize the valuable experience and special business of 11 power supply units directly under the company and the requirements of provincial companies for the analysis of economic activities of power supply units, further improve and expand the business functions of the system, strengthen the depth and comprehensiveness of the system analysis, and develop a sub-system for the analysis of economic activities of power supply units. It is also widely applied in the 11 power supply units directly under the provincial company.

**Analytical Results Query System**

In order to facilitate mutual communication between management and analysts, we must establish an inquiry system for analysis results.

**Conclusion**

After putting into operation, the integrated data analysis system of power grid can greatly improve the work efficiency of economic activity analysts, improve the overall management level of
enterprises, provide scientific basis and powerful assistance for business decision-making, and bring comprehensive social and economic benefits.

Acknowledgment
This work was supported by Shaanxi Province Education Science Planning Topic “Empirical Research on Teaching Reform of the Course Fundamentals of Computer Application Based on Working Process Systematization in the Background of Transformation and Development” under Grant No. SGH17H461 . It is also supported by the Natural Science Foundation of Xi’an Peihua university “Research on Dynamic Migration Algorithm of OpenFlow Switch Based on Attractor Selection in Cloud Environment” under Grant No.PHKT18062.and supported by Xi’an Peihua university Horizontal Research Project "Data Visualization System Platform Development" under Grant No.2018083002.

Reference