

## Design and Implementation of Power Customer Credit Rating Evaluation Management System Based on Customer Grouping

Ma Junjuan, Qiu Lingyun, Wang Qin

Sichuan Electric Power Company Customer Service Center, Sichuan Chengdu, 610000, China

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**Abstract:** Electricity, as an indispensable resource in the real world, provides great convenience for our life and work, among which power enterprises play a vital role as a bridge between power generation and consumption. The main factors involved in power customer grouping are customer value, customer demand and customer behavior, etc. In customer grouping management, customer data mining algorithm is used to realize automatic classification of objective customer groups. The analysis of different customer needs is based on the customer segmentation theory. In the management of power customer group, different power products, power sales and power services can be provided according to different customer value, demand and behavior. This paper classifies the customer groups according to the credit rating of power users, and puts forward the service quality improvement methods for different power users, so as to provide personalized customized services for power customers and reduce the burden of power enterprises.

### 1. Introduction

In order to solve the problems of customers defaulting on electricity charges and stealing electricity which affect the survival and development of power companies, various power supply companies have put forward various administrative management means and explored technical update means [1]. In a society with developed market economy, the essence of economic activities is actually credit economy. Therefore, for any enterprise, credit management is very necessary. The main factors involved in grouping power customers are customer value, customer demand and customer behavior [2]. In the process of customer grouping management, the customer data mining algorithm is used to realize the automatic classification of objectively existing customer groups. At the same time, in the management of power customer groups, different power products, power sales and power services can be provided according to different customer values, needs and behaviors [3]. Electricity is an energy source driven by electric energy, and it is an important basic industry in the development of national economy. In power system, the primary energy is converted into electric energy by the power plant, and then the electric energy is transmitted to the electricity customers by the power enterprise through substation [4]. Differentiated marketing is based on different customer needs, and the analysis of different customer needs is based on customer segmentation theory [5].

With the advancement of self-marketization, electric power enterprises have become the trading subjects under the market economy. Market economy is both a credit economy and a risk economy. Under the condition of market economy, market subjects should not only strictly abide by credit, but also avoid risks [6]. Under the condition of electricity market, the problem of electricity fee recovery is an important problem faced by power supply enterprises, which not only affects the business conditions of enterprises, but also relates to the survival and development of enterprises. Therefore, it is necessary to comprehensively evaluate the credit of power customers, so as to avoid the risk of electricity fee recovery [7]. In the process of power system reform, the requirement of improving service quality is put forward. However, there is no guiding policy and guideline on how to improve the service quality of power enterprises, and there is no unified evaluation index [8]. In order to occupy a dominant position in many competitive enterprises and retain or attract more customer resources, power enterprises should have real autonomy, establish a power marketing system centered on customer demand, continuously increase customer management and service, and promote the development of enterprises [9]. In this paper, the customer groups are classified

according to the credit rating of power users, and the service quality improvement methods for different power users are put forward in order to provide personalized customized services for power customers and reduce the burden of power enterprises, which is of great significance to power enterprises.

## 2. Composition of Power Customer Credit Rating Evaluation Management System

Customer service of electric power enterprises usually refers to the process that electric power enterprises meet the service needs of users of electric power products on the basis of no physical ownership transfer. The information concerning customer credit is very extensive, including the financial status, income status, operating status, competitive position, future development trend, economic environment and other credit-related aspects of the appraised object. The corresponding index factors need to be taken into account in the evaluation of power customers' credit rating, and the selection of indexes needs to cover all aspects of customer credit rating as comprehensively as possible according to the relevant customer credit rating contents, so as to carry out a comprehensive evaluation of power customers' credit rating [10]. It can be subdivided according to customers' demands, and the different demands of power customers for power products, such as reliability of power supply, stability of voltage, thoughtfulness of service and other factors, can be taken as the basis for subdivision. The quality of customers' credit is directly related to whether the electricity charges of power enterprises can be recovered in full and on time. Therefore, electric power enterprises should make a good credit rating system for customers and implement different policies for customers with different credit ratings to reduce the risk of electricity fee recovery. Because of its unique invisibility, inseparability, instability and non-storability, and as a public utility closely related to all walks of life, compared with general enterprises, electric energy also requires higher safety credit and reliable credit for customers' electricity consumption.

Discriminant analysis model is mainly based on the known default and non-default data to classify and form several parent groups. One or more discriminant functions or criteria are found from the characteristics of multiple parents of these data, which can be used to judge which parent any observed vector belongs to. Choose the most commonly used Fisher's linear discriminant analysis model LDA. In the case of binary classification, the discriminant function is:

$$Z = \sum_{i=1}^n \alpha_i X_i \text{ or}$$

$$D(X) = X' \sum^{-1} (\mu_1 - \mu_2) - \frac{1}{2} (\mu_1 - \mu_2)^T + \sum^{-1} (\mu_1 + \mu_2) \quad (1)$$

Among them, Z, D(X) are credit risk scores; X is the variable vector in credit evaluation;  $\alpha_i$  is the coefficient value of the i-th variable, obtained through regression or the characteristic root of the parameter matrix;  $\mu_1$ ,  $\mu_2$  are the averages of the two groups,  $\sum$  is the inverse covariance matrix.

The sensitivity analysis of each influencing factor of a single project can be carried out, and the project risk management can be carried out in the analysis result. Table 1 shows the sensitivity analysis results of risk assessment. The link between risk assessment and changes in risk factors is shown in Figure 1.

Table 1 Sensitivity Analysis Of Risk Assessment

	Evaluation value	Score after change
Production risk	0.784	0.714
Manage risks	0.555	0.982
Technical risk	0.743	0.833
Market risk	0.612	0.672

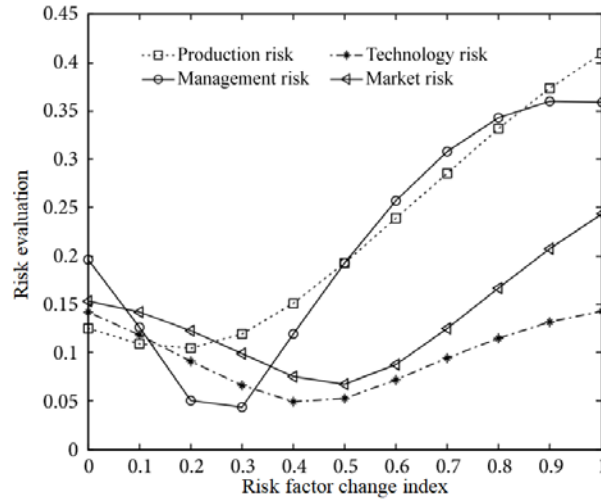


Fig.1 Relationship between Risk Assessment and Change of Risk Factors

In the power industry, customer value is the prerequisite for customer marketing and customer service. At present, in order to provide differentiated and personalized customer services to power customers, a few power companies are conducting customer value evaluation and customer classification. The life cycle curve of project management is shown in Figure 2.

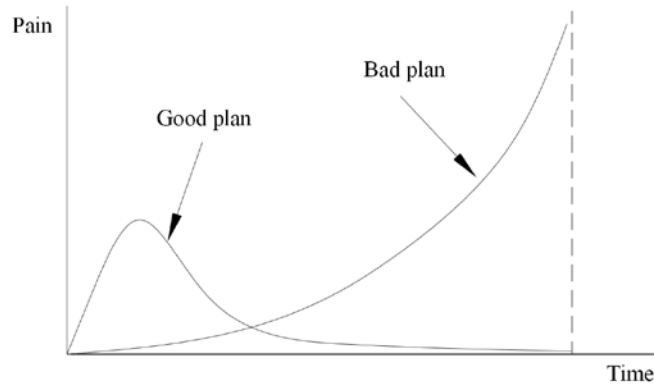


Fig.2 Life Cycle Curve of Project Management

The financial status of client enterprises can be reflected by asset-liability ratio, current ratio, return on net assets and loan repayment rate on schedule. The electricity consumption status of customers can be reflected by electricity consumption. Customers' feelings about the service quality provided by power supply enterprises are extremely subjective. The index of service quality sensitivity describes the comparison between customers' expectations of service quality and their actual service quality level. The greater the change of customer satisfaction caused by the change of the same service quality, the higher the sensitivity. The status of equipment operation and management can be reflected by the presence or absence of reactive power compensation devices, whether to run equipment calibration on schedule and the impact of equipment accidents on the power grid [11]. Social credit status can be reflected by social credit rating. Unlike financial institutions, power supply enterprises need to consider the risks brought by investment, and it is difficult to equip enough professionals to conduct complex comprehensive evaluation for many customers. It is easy to master the quantitative evaluation method, and it is convenient to solve the problems of many customers, and it can also meet the needs of power supply enterprises.

### 3. Differentiated Service Marketing Strategy for Establishing Credit Rating of Power Customers

#### 3.1 Analysis of System Functional Requirements and Influencing Factors

For high-value customers, they can be equipped with special account managers to collect their

electricity demand and follow up in time, provide on-site service function, and ensure the comprehensive implementation of power grid supporting systems on the basis of satisfying the stability and safety of electricity consumption. The goal of customer quality evaluation system of power companies is to provide basis for power companies to improve service quality, aiming at providing targeted services for power customers. The determination of system functions should be based on the service content of power companies and guided by customer service needs. Account managers should communicate with high-value customers in a timely manner, and negotiate with customers before power failure is expected, so as to provide them with a priority channel for fault reporting and repair, and establish a perfect emergency response mechanism. When the electricity customer repays a certain amount of overdue electricity charges within a certain period of time, the power supply enterprise will return part of the overdue electricity charges to the customer as a reward according to a certain proportion, and with the reduction of the overdue electricity charges of the electricity customers, its credibility will be improved accordingly. Within the scope of national standards, it is best for power enterprises to establish corresponding customer-provided emergency power supply according to requirements, so as to provide power demand for customers with high sensitivity to power failure after power failure. The goal of treating customers with high credit is to maintain the relationship between power supply and consumption, and continue to improve customer satisfaction. For such customers with good credit, even if they enjoy price concessions, their payment status will not be greatly improved. Moreover, because customers consume a lot of electricity, considering the operating expenses of power enterprises, it is not appropriate to adopt price strategy to grant credit to them. Electric power enterprises should take corresponding measures in time to ensure that power outage sensitive customers can know the power outage information in time, so that they can do a good job in response in advance. Electric power enterprises should publicize their responsibilities for defaulting on electricity consumption [12]. For such customers, they should regularly implement on-site service, conduct electricity inspection and collect electricity charges, conduct corresponding follow-up investigation on customers who habitually default on electricity charges, and take corresponding punishment measures according to relevant standards.

### **3.2 The Construction Principle of Customer Service Quality Evaluation System**

Differentiated service marketing for customers is widely implemented in domestic banking and telecommunications industry, but it is undoubtedly a brand-new measure for Chinese power supply enterprises. The evaluation system of customer service quality should be constructed scientifically as far as possible on the basis of meeting the basic functional requirements. The ultimate goal of differentiated services is to serve customers better, not to widen the service gap. The purpose of market segmentation of power supply enterprises is to determine the demand characteristics of different customers and provide targeted services for customers. The credit rating of power customers is mainly evaluated according to the customer's credit behavior and social credit in power enterprises, and the credit parameters are given the corresponding rating when evaluating. The system evaluates the credit rating of power customers based on the evaluation index of power customers' credit rating and the established customer credit rating model, so as to provide differentiated services to customers of different grades, especially to provide quality services to high-quality customers, so as to avoid customer churn. Different customer groups have slightly different evaluations on customer service quality. Customers with average electricity consumption want more personalized services, while customers with large electricity consumption want service demands to be answered and service demands to be solved as soon as possible.

## **4. Conclusion**

Customer credit management is a highly professional work, involving many departments or businesses such as budget, marketing, finance, production, etc. It is a comprehensive management field. At present, there are still some problems in the clustering work of power enterprises, which require the relevant power industry supervision and management departments to cooperate with the

clustering work of power customers to ensure that different types of power users can get high-quality power services. This paper mainly introduces the design and implementation of power customer credit rating evaluation system. Different customer groups have slightly different evaluations on customer service quality. Customers with average electricity consumption want more personalized services, while customers with large electricity consumption want service demands to be answered and service demands to be solved as soon as possible. Differentiated marketing of power supply enterprises is a marketing strategy for the current weak credit awareness of Chinese enterprises and customers. Through the implementation of differentiated marketing, the credit awareness of enterprises and customers can be improved, and the recovery rate and turnover of electricity fee funds of power supply enterprises can be improved as much as possible. Power customer service has the characteristics of universality and invisibility. When providing power business services, customers should be divided into different groups with reasonable characteristics, so as to provide targeted services.

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