Research on the Construction and Application Strategy of Precision Marketing Model for Industrial and Commercial Customers

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Abstract. In the new electricity market, the main body of the market has evolved from the traditional electricity generation to the multi-subject, and the customer value has changed. Based on the traditional method of evaluating the electricity customer value and new value after the release of power market, design new evaluation indexes for adapting the electric reform. Fuzzy analytic hierarchy process (FAHP) and entropy weight method are adopted to combine the overall weights of the design indexes and TOPSIS method is used to evaluate customer value comprehensively. According to the two dimensions which are customer value classification and customer stickiness, the main service mode for the sale electricity agent is designed. Through the example analysis, the quantitative results and the service strategy are put forward to provide assistant decision support for the differential operation of the sale of electricity entities.

1. Introduction

In March 2015, after the publication of No. 9 Document of Electricity Reform, the State officially issued the Implementation Opinions on Promoting the Reform of Electricity Sales Side, which is one of the six supporting documents of the new electricity reform. From this document, it can be seen that the social capital opens up the electricity sales business, and the competition subjects in the electricity sales side market are cultivated through various channels, resulting in more users having the right to choose, and the quality of electricity sales service and the energy consumption level of users will be significantly improved[1]. With the gradual advancement of the electricity sales market, the national electricity sales companies have been established one after another. As of August 2017, a total of 8,124 companies have been registered in the electricity trading center in China, and 1,817 electricity sales companies have been publicized. In addition to the power grid, power generation enterprises, energy-saving service companies and distributed power generation enterprises may become new power sales entities[2]. At the same time, industrial parks, commercial complexes, large residential quarters, industrial and commercial users and large industrial users have made new changes in their demands for energy consumption after the new electricity reform. For example, the emerging industrial parks are committed to clean and flexible energy, some large residential quarters and commercial complexes want convenient and high-quality energy consumption experience, while large industrial users want lower electricity prices or good power quality. At the same time, some power customers have also built their own distributed power sources, installed energy storage devices or reformed equipment to participate in the power market. The main body of the electricity sales market has gradually evolved from the traditional main body of electricity generation
and consumption to the multi-main body, and new value points have emerged. Therefore, the electricity sales companies need to build a power customer value evaluation method and service model to adapt to the new electricity reform, so as to provide auxiliary decision support for differentiated operations.

At present, the research on the theory and method of power customer value at home and abroad mainly focuses on the definition of customer value, the index system of customer value evaluation, the model and method of customer value evaluation, customer value grading and so on [3-12]. When defining customer value, customer value is generally evaluated from two aspects: one is the value provided by the enterprise to the customer, and the other is the value of the customer to the enterprise. From the customer's point of view, customer value is the value identified according to its own evaluation criteria. From the perspective of enterprises, customer value is a resource, which can bring benefits to enterprises. The value that customers can create for enterprises is based on variables such as customer consumption behavior and consumption characteristics. At present, most domestic and foreign researches on power customer value from the perspective of enterprises, without considering customers' perception and expectation. In the previous research on the index system of power customer value evaluation, the index system was mainly constructed on two levels: current value and potential value of power customers. The current value generally includes customers' economic contribution, operating status, credit status and power management level, while the potential value mainly considers customers' future load and power growth [3,9,10,11]. In the power customer value evaluation model and method, a relatively complete matrix model has been formed at home and abroad. This matrix model is compiled on the basis of relatively complete data, which is applied to customer segmentation, so as to better serve high-quality customers. At present, the popular evaluation methods of power customer value abroad mainly include univariate model [4], analytic hierarchy process [5], rough set method [6] and data mining technology [7]. Domestic scholars mainly tend to fuzzy comprehensive evaluation method [9], entropy weight method combined with expert experience method [10], integrated rough set and support vector machine [11], ant colony intelligent algorithm [12], etc. Customer value grading is generally to grade customers according to the evaluation results after the customer value evaluation is completed, which is mainly based on the value, and finally divided into important customers, general customers and low-value customers, and different marketing strategies are adopted for different types of customers.

2. Analysis of industrial and commercial customers characteristics

2.1 Basic attribute analysis

Captions should be typed in 9-point Times. They should be centred above the tables and flush left beneath the figures. The basic attribute of customers is the basic performance of customers' electricity consumption, which mainly includes all kinds of raw data of electricity consumption, usually collected and counted directly. Among them, it is mainly the customer's numerical discount, which describes the basic static information of a customer and is the basic supporting data of the customer portrait.

The main body of industrial and commercial customers is often enterprises or individual industrial and commercial households. To gain insight into the basic information of enterprises, it is necessary to focus on the information related to enterprises, such as basic information such as credit rating and scale, power attributes such as power supply mode and contract capacity, and value information such as industry and profit.

2.2 Behavior characteristic analysis

Customer's behavior attribute is the basic performance of customer's electricity consumption, which mainly includes all kinds of raw data of electricity consumption, which is dynamically stored and updated in the process of customer accumulation. The updated frequency is dynamic information, which plays a key role in building real-time and accurate user behavior decision.

The behavior of industrial and commercial customers is mainly influenced by business activities, which also makes the behavior of industrial and commercial customers significantly different from that of other customers. Under the influence of business activities, enterprises' electricity consumption
behaviors, such as payment behavior, capacity behavior, breach of contract behavior, and enterprise electricity consumption standards, have unique characteristics, so they need to be considered when designing labels.

2.3 Analysis of preference characteristics
Customer preference characteristics are mainly to further extract, analyze and model basic attributes and behavior characteristics, and to determine current user preferences through data mining models. It also requires the ability to update in real time, and must meet dynamic decision preferences and provide accurate recommendations.

The preference characteristics of industrial and commercial customers are related to the power products they choose and the channels for obtaining services, so it is necessary to focus on service product preferences and channel preferences.

2.4 Analysis of Feedback characteristics
The feedback characteristics of customers are mainly the return visit data records of power workers to customers, but the customer psychology can not be completely modeled according to the basic attributes and behaviors of customers. The targeted manual feedback can enhance emotional analysis, collect service feedback, make the data flow form a complete closed loop, and improve the humanization of decision-making.

Because of the large amount of electricity used by industrial and commercial customers, the impact of their satisfaction on the company is very important. Business needs make industrial and commercial customers pay more attention to the quality of power supply services and the prices of various services, so they should focus on them.

3. Analysis of customer characteristics and electricity consumption behavior of industrial and commercial customer segments

3.1 Analysis of industrial and commercial customers characteristics
Based on the experimental classification results, this paper analyzes the characteristics and user values of 14 user groups of industrial and commercial customers. From the service feedback, user characteristics, user preferences, and user behavior, seven groups with typical characteristics are selected. The other groups have similarities, and are divided into seven groups, i.e., high-quality customers, potential customers, price-sensitive customers, promotion customers, brand customers, general customers, and low-value customers. The number of samples accounts for more than 90% of the total.

Industrial and commercial electricity customer group segmentation is an important prerequisite for the fine marketing of electricity customers. Group segmentation of industrial and commercial customers is carried out from the perspective of data mining, which helps the refined management of marketing business in the application. On the basis of multi-dimensional clustering technology and customer segmentation theory to screen and identify the industrial and commercial electricity customers and the basic classification, the different marketing service strategies are formulated for each type of customers according to the label characteristics of each group.

| Serial number | Group classification | Characteristic value analysis |
|---------------|----------------------|------------------------------|
| 1             | High quality customer| High power consumption, price insensitivity, low telephone frequency, high satisfaction and high credit rating. |
| 2             | Potential customers  | High power consumption, low household age, high telephone frequency, high price satisfaction, low return visit frequency and product awareness, sensitive price, large enterprise scale and strong profitability. |
|   | Price sensitive customers | High traffic frequency, moderate satisfaction, high payment frequency, low electricity consumption, and high service requirements. |
|---|---------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| 4 | Promotional customers     | Higher electricity consumption, older households, lower product awareness, moderate satisfaction, lower frequency of return visits, moderate profitability, larger enterprise scale and less access to services. |
| 5 | Brand customers           | Older customers, higher product awareness, higher credit rating, more access to services, moderate satisfaction and higher frequency of return visits. |
| 6 | General customers         | Moderate power consumption, low product awareness, moderate satisfaction, low frequency of return visits, moderate profitability and moderate enterprise scale. |
| 7 | Few-value customers       | Low payment frequency, high overdue times and low credit rating.                                                                     |

3.2 Analysis of electricity consumption behavior of industrial and commercial customers

In the management of power demand side, the analysis and prediction of power consumption behavior is a key work. After the opening of the electricity sales market, industrial and commercial electricity users are the main body of the electricity market, and their electricity demand has a great impact on the electricity market. The electricity consumption in the industrial and commercial market is an important index for each main body of the electricity sales market to refer to when formulating strategies. Buyers and sellers estimate the transaction price and transaction scale by predicting the possible electricity consumption behavior in the future, so as to formulate their own marketing and trading strategies. For electricity sales enterprises, the accuracy of forecasting industrial and commercial electricity consumption behavior determines their grasp of the direction of electricity sales market; For power suppliers, accurate prediction of power consumption behavior plays a very important role in making power generation plans, energy sales plans and allocating power resources reasonably.

Users' electricity consumption behavior is closely related to many internal and external factors. Internal factors mainly include industry attributes and user characteristics, such as industry attributes of industry and commerce, electricity consumption characteristics of special buildings such as industrial workshops and commercial buildings, etc., while external factors cover social economy, geographical environment, climate region and other aspects. Fully exploring the influence of these multi-source factors on electricity consumption behavior is helpful to make a more accurate and reasonable electricity distribution plan. Users' electricity consumption characteristics depict users' electricity consumption behavior through different dimensional indicators, so it is necessary to digitize the electricity consumption characteristics of electricity users. In addition to these influencing factors, the electricity load data of industrial and commercial customers not only has typical big data characteristics, such as large capacity, high speed, diversity, but also has its own characteristics, such as time series and high dimension. Therefore, before analyzing the electricity load data, appropriate dimensionality reduction or feature correlation analysis and compression can effectively improve the performance of the algorithm, simplify the output model for users to understand, save computing resources, reduce computing time and reduce over-fitting.

Based on the above analysis, this topic needs to study the analysis and prediction model of industrial and commercial customer behavior based on feature engineering. Relying on the previous research contents, supported by the category system of electricity consumption behavior, adopting the analysis and prediction method based on feature engineering, this paper puts forward some feature correlation analysis and compression technologies, and integrates the regression prediction method of electricity consumption, establishes an analysis and prediction model of industrial and commercial customers' behavior based on electricity consumption characteristics, realizes the accurate prediction of electricity consumption behavior, and provides a model basis for customizing the marketing strategy to meet the dynamic needs of users in the next step.
4. Construction of Precision Marketing Model and Analysis of Marketing Strategy

4.1 Construction of Precision Marketing Model

1. Construction of weighted keyword co-occurrence time element. Text, as an important information carrier, implies potential user portraits and preference information of power consumption behavior characteristics. In the text semantic mining method, we usually assign a corresponding time information to each keyword semantic unit in the text information to form a keyword semantic time element to express the text semantic information briefly, and the basic expression is shown in the formula:

\[ \text{SemanticTimeGram} = \langle \text{semanticUnit}, \text{time} \rangle \] (1)

In this paper, a two-word co-occurrence pair method composed of two keywords is used to construct user personalization. The evolution trend time sequence path of portrait and power consumption behavior characteristic pattern is referred to as keyword co-occurrence time element for short, and the specific expression method is shown in formula:

\[ \text{CooccurredKeywordTimeGram} = \langle \text{Keyword1}, \text{Keyword2}, \text{time} \rangle \] (2)

At the same time, in order to better reflect the strength of keyword co-occurrence relationship and the validity of keyword time sequence path expression, we assign corresponding weight information to keyword co-occurrence time elements to form weighted keyword co-occurrence time elements.

2. Keyword weight calculation settings. By combining the obtained extended keywords in the text content with the existing keywords, we can get the complete keyword list information related to the current user. At the same time, we can get time information and keyword frequency data related to user data in the list. The weight of a keyword consists of three parts: the first part reflects the importance of the keyword itself, and \( \text{weight1}_{\text{keyword}} \); is usually calculated by TFDIF; The second part reflects the semantic similarity between keywords and the theme of text content, which is usually calculated by PBA to obtain \( \text{weight2}_{\text{keyword}} \); In the third part, the semantic similarity between the keyword and tag information is reflected. Usually, the semantic knowledge model Google News-Vectors-Negative300.bin and word2vec, which are trained by Google, are used to calculate and obtain \( \text{weight3}_{\text{keyword}} \). We give the formula for calculating the final weight of keywords as shown in:

\[ \text{weight}_{\text{keyword}} = a \cdot \text{weight1}_{\text{keyword}} + b \cdot \text{weight2}_{\text{keyword}} + c \cdot \text{weight3}_{\text{keyword}} \] (3)

Where, the sum of the three is equal to 1.

3. Keyword weight calculation setting. When constructing the time sequence path of keyword expression, we usually combine keywords with high co-occurrence weight, so that the constructed time sequence path of keywords is meaningful. Generally, the co-occurrence weight calculation of keywords only considers the co-occurrence relationship of the number, which is one-sided, and the calculated weight cannot effectively express the correlation between two keywords. In order to effectively avoid the above problems, we comprehensively consider the weight of keywords and the influence degree of keyword frequency. The weight of keyword co-occurrence is calculated, which can better reflect the connection degree between co-occurrence keywords. At the same time, we also consider the semantic similarity between keywords. Usually, we cluster the keywords of user-related text content. If two keywords belong to the same category, we think that the co-occurrence weight between them is low. On the contrary, we think that the co-occurrence weight between them is higher. In this way, we can clearly depict the evolution trend of the user portrait and the characteristic pattern of electricity consumption behavior through the keyword time sequence path spliced by the method of keyword weighted co-occurrence.

\[ \text{relation}_{\text{keyword1}, \text{keyword2}} = \frac{\sum_{\text{movie1}} (\text{weight}_{\text{keyword1}, \text{movie1}} \cdot \text{weight}_{\text{keyword2}, \text{movie1}})}{\sum_{\text{movie1}} \text{weight}_{\text{keyword1}, \text{movie1}}} \] (4)
4.2 Construction of Precision Marketing Model

Construction of weighted keyword co-occurrence time element. Text, as an important information, if a power selling company wants to create differences from this kind of undifferentiated power products and services, it can only be reflected by the differences in value-added services. At present, the value-added services of power sales companies in the industry are rich and varied, including energy management, energy efficiency analysis, energy conservation and emission reduction, power operation and maintenance, etc.

For any producer, choosing sales channels is one of the important decisions. If the sales channels are properly selected, the market can be expanded as soon as possible. There are two main factors that affect the choice of power sales channels: power product factors and power market factors.

1) Power product factors. Power product factors mainly refer to electricity price level, power characteristics and technical requirements of power production. As a special commodity, electricity price level, electricity characteristics and technical requirements of electricity production are the main factors affecting the choice of electricity sales channels. The level of electricity price is the main factor affecting the sales channels of electricity. With the establishment of electricity market and the possibility of trading in different places, the level of electricity price will affect the choice of different power sources or power sellers by power customers, and then influence the choice of power sales channels.

The instantaneity of electric energy production, supply and sales and the technical characteristics that electric energy cannot be stored are also important factors that affect the selection of electric power sales channels. Because the transmission of electric energy must rely on a certain transmission network, that is, power network. Therefore, the selection of power sales channels is largely determined by the existing power network, and the construction of power network is an important factor affecting the selection of power sales channels.

2) Power market factors. Commodity and market are inseparable, therefore, market factors have an important influence on the choice of sales channels. Power market factors mainly refer to the service requirements of power customers and power market environment factors. The service requirements of power customers to sales channel members mainly include: providing customers with safe, reliable, economical and reasonable electric energy; providing customers with guidance and consultation on the use of electric energy, etc.

The environmental factors of electricity market include political environment, economic environment and natural environment related to electricity market. The political environment related to the power market mainly refers to the national policies and decrees, especially the laws and regulations related to the power industry: the economic environment mainly refers to the state of economic development and people's living standards; Natural environment mainly refers to the status of various natural resources and the protection of ecological environment.

5. Conclusion

With the deepening tide of global economic integration, the reform of power system has been further developed, the power industry has gradually introduced the market competition mechanism, and the power marketing strategy has been continuously improved. The power industry has bid farewell to the monopoly era of "power boss" in the past, the market competition has become more exciting, and the power marketing mechanism has begun to be established in a more flexible, fair, transparent and reasonable direction. The electric power marketing mode which is more suitable for market competition stimulates power supply enterprises to constantly improve product series, improve service quality and seek mechanism innovation, and also promotes the overall development of domestic electric power industry.

The modernization and integration of electric power marketing mainly focuses on business intensive management, improvement of marketing organization and system, and construction of integrated marketing information system. For example, State Grid has proposed to build a modern marketing management system of "intensive management mode, standardized management process, informationization of management means, standardized power supply service and professional staff
quality”, which has achieved standardization and standardization from aspects of organizational structure, business process, management norms and information systems, laying a foundation for the development of enterprise group operation.

Compared with foreign countries, the degree of marketization of the electricity sales side in China is lower, and compared with other domestic energy industries, telecommunications, banking and other public utilities, there is also a gap in market openness and competitiveness. Therefore, under the general trend of continuous marketization of the power selling side, the advanced practices and evolution trends of the same industry and similar industries will provide a good reference for the development of China's power marketing. Under the background of deepening marketization, power grid enterprises will make great changes and innovations from marketing mode to business mode on the basis of maintaining the attributes of public utilities.

This development trend is in line with China's current ideas of innovation, coordination, green, openness and sharing, and is conducive to the sustainable development of power supply enterprises. Under the guidance of relevant power marketing theories, combined with the current research situation at home and abroad, this topic establishes customer portrait and subdivision model based on data analysis, classifies customers according to the differences of attributes, behaviors, needs and preferences of customers and the limited resources of enterprises in specific marketing modes and markets, and establishes customer analysis calculation and distribution model based on customer behavior characteristics. On the marketing strategy side, based on 4P marketing theory, the closed-loop marketing strategy of power enterprises is constructed, including comprehensive energy service product system strategy, accurate support transaction price strategy, power market channel development strategy, power promotion strategy and demand-side guidance strategy. On this basis, through the label standardized data analysis of customer portraits and power consumption behavior characteristics, the PBA model of precision marketing based on personalized recommendation of user marketing strategy based on label time series can provide targeted products or services and better participate in market competition. Through customer portrait and subdivision, electric power enterprises can know the most valuable customers for enterprises, expand and maintain high-value customer groups, attract and strive for potential customer groups, provide basis for enterprise decision-making, and have good popularization and application value.

Acknowledge funding
This research was funded by the project of “Research on Key Technologies of big data electricity consumption behavior analysis and precision marketing for industrial and commercial customers”(1400-202053218A-0-0-0-00)

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