An Evaluation Approach of Power Customers’ Perception Value

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Abstract. To exactly evaluate customers’ perception value is very essential to improve power grid companies’ competitive power. However, no adaptive and systematic customer service perception value evaluation approach has been presented, which greatly restricts the further improvement of power grid companies’ service ability. To fill this gap, an evaluation method composed of five dimensions and ten secondary indicators of power customer service perception is proposed, in which the specific evaluation indices and weights could be determined by the investigation methods. Our proposed evaluation approach shall play an important role in constructing and improving the customer-centric power supply service systems.

Introduction

All the time, the situation of monopoly management makes the Power Grid Corp's attention to customer perception relatively weak, and there is no adaptive and systematic customer perception research. While many industries have perceived value research results into practice, especially in the field of full market competition, customer perception very seriously, constantly adjust the perceived value of customer service measures, improve the marketing way, to get stronger market competitiveness.

Along with China's electricity market reform entering to deep water area, sell electricity side liberalization, the incremental distribution business liberalization and orderly development, and the sale of electricity companies are competing, the competition is increasingly fierce. Internal environment and external changes have put forward new requirements for the operation of the power grid enterprises. The power customers become the focus of the market competition, and the power customer service has become the core competitiveness of the market share. Under the condition of market competition, it is of great realistic significance and value to study the needs of customers and to maintain and attract customers.

Perceived value is the overall evaluation of the product or service based on the comparison between the income and the cost of the consumer. Customer perceived value represents the intensity of customers' willingness to repeat products and services and willingness to pay for fast services. It is very important to quickly grasp the value and value of customers and transform the marketing mode. Domestic and foreign scholars have studied the perceived value of products and services in different industries. He Lingjun proposed seven dimensions of the customer perceived value of express service and used empirical analysis to verify, refer to document 1 for details. Literature 2 quantifies the perception of express service by means of factor analysis and puts forward the pricing method of express service based on customer perceived value. Literature 3 builds the customer perceived value structure model from the overall perception value of mobile data services, the perceived value of mobile operators and the perceived value of content providers. Literature 4 analyzes and studies the factors that influence the customer perception of online banking service quality. From the perspective of "multi-factor", literature 5 believes that customer perceived value is the comprehensive perception result of multidimensional degree, including five dimensions of functional
value, emotional value, social value, conditional value and cognitive value. Literature 6 changes the value evaluation of logistics attribute level in the past, establishes the logistics customer value hierarchy model, starts from the expectation value of the logistics customer, finds out the expectation value needs to obtain the benefit, and then analyzes the logistics attributes that can promote the realization of the benefit from the logistics operation level. However, the research on the customer perceived value of the power industry is less, and the reference literature with practical value has not been seen yet.

**Current Situation of Customer Service in Power Grid Enterprises**

**Changes in Customer Demand**

In the power supply and demand chain relationship, the mode of "the only power supply enterprise to provide customers with the status quo of electric power business and service" has changed. The customers have more choices, forcing the power supply enterprises to establish strong customer relationship. At the same time, the service objects are becoming more and more diversified. The customers, the large direct trading users and the selling electric enterprises are all the customers who need the service. At the same time, a large number of distributed energy, micro network, electric vehicle users and so on.

With the continuous development of economy and society and the popularization of Internet and information technology, customers have higher requirements for reliability, convenience and timeliness of power supply services, and expect safe, reliable, efficient and all-round power supply services. Customer demand is no longer a simple power supply guarantee, making more requirements for additional value-added services and innovative service products.

Customers' demands for grid enterprises have been transformed from power supply and energy quality to focus service quality (reliability, convenience and timeliness) and power consumption perception. The transformation of customer requirements is shown in figure 1.

![Figure 1. The transformation of customer requirements.](image)

**Current Status of Power Customer Service**

The power supply service is a special link between the power production part and the customer. In recent years, power grid enterprises to continuously enhance the ability of power supply service, the integration of service resources, has made great achievements, has initially formed a power supply service system in marketing. However, the customer perception work still has a certain gap with other competitive enterprises, so it needs to strengthen customer perception analysis and better meet customer needs.

**Power Customer Perception Factors**

Power grid enterprises are faced with a large customer base, and the difference between groups is obvious. The perception standard, perception process and perception result are different. In fact, the power customer perception is actually a complex consisting of several elements that interact with each other. Based on the research of domestic and foreign scholars, this paper finds out the general
factors of common factors through the conversation with the interviewees, then designs the questionnaire for the influencing factors, and distributes the staff directly to the customers, such as the customer manager and the sales office of the power supply office. Meanwhile, it is also randomly distributed to different types of customers. Through the analysis and summary of the questionnaire survey, the following main factors are found to affect the customer perception:

**Safety and Reliability of Power Supply**

The customers want the power grid enterprises to provide continuous, safe and reliable electricity service. This is the most basic electricity demand of the customer. The reliability of power supply and the qualified rate of voltage have reached the standard of public commitment and have been continuously improved.

**Service Prescription**

The customer wants to run the power, or when there is a power failure, etc. The power grid enterprise receives the information, responds quickly, and solves the problem in time

**Service Attitude**

In the process of service, the customer service staff's service and behavior should be intimate, meeting the customer's psychological needs.

**Service Mode**

The service is convenient, the service channel is rich, the service product iterates quickly. Service skills require proficiency, specification and standard.

**Value Added Service**

In addition to meeting basic needs, it provides personalized service, energy efficiency services, pushing energy saving information and providing comprehensive energy services solutions.

**Brand Image of Enterprise**

Compared with other public utilities, power grid enterprises should improve their social reputation, awareness and brand image. The higher the correlation with the social government, the stronger the customer's trust. The higher the association with the social government, the stronger the trust of the customers.

**Economy**

Energy price and cost are the factors that customers are more concerned about. Electricity is a homogeneous product. The rise and fall of the price of electricity has a great impact on users' perception. At the same time, because of the adoption of energy saving measures, the change of electricity expenditure is also a major factor affecting the perception of users.

According to these factors, we can summarize the five dimensions, namely, basic value, emotional value, value-added service, social value, economic value, etc. See table 1 for details.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Essential factor</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic value</td>
<td>Power supply safety, Reliability, Service timeliness (quick response)</td>
<td>Meet requirements under technical conditions</td>
</tr>
<tr>
<td>Emotional value</td>
<td>Service attitude service (normative, standard)</td>
<td>Satisfaction, Sense of gain and pleasure</td>
</tr>
<tr>
<td>Value-added service</td>
<td>Push information, Energy efficiency energy efficiency service</td>
<td>The more the better</td>
</tr>
<tr>
<td>Social value</td>
<td>Corporate brand and social reputation</td>
<td>Compare with other public utilities</td>
</tr>
<tr>
<td>Economic value</td>
<td>The price of electricity, Electricity fees</td>
<td>Price costs compared to other electric companies'</td>
</tr>
</tbody>
</table>

Table 1. Influence Factors Of Customer Perceived Value.
Research on Measurement Method of Power Customer Perceived Value

The Establishment of the Index System. In this paper, we need to use less information to make the power customer perceived value measurement process mathematization and express the customer perception level in the form of concrete numerical value. On the basis of investigation, we take into account the influence factors of five dimensions and find out the quantified ten data indicators. This paper puts forward the system of value indicator of power customer service perception, as shown in figure 2.

Figure 2. Power customer service perceived value index system.

The data of power supply reliability, voltage qualification rate and qualified rate of on-site rush time for characterizing basic values are obtained by statistics of power grid enterprises. The power customers can produce corresponding evaluations through publicity results. The emotional value by service satisfaction rate and PCED ranking characterization, evaluation of service satisfaction rate is already included on customer service mode, service attitude, service standards and other aspects of the evaluation. Value-added services are represented by the number of value-added services and the satisfaction rate of value-added services. The social value representation is mainly represented by the company brand value of power grid enterprises. The economic value is mainly reflected in the electricity price and electricity price.

Weight Assignment. In order to get accurate and correct final result. According to the importance of each dimension index defined in this paper, we give different weights to each index, and the evaluation index value of the power customer's quantized perception value is obtained by the weighted sum of each index. We design the following formula.

$$PCPV = A_1V_1 + A_2V_2 + K + A_iV_i$$  \hspace{1cm} (1)

Among them, $PCVC$ is the perceived value of power customers, $i$ represents the number of dimensions of customer perceived value; $V_i$ is the evaluation score of customer perceived value dimension, and $A_i$ is the weight. Where $i=5$, the $A_i$ values range from 1 to 100.

In the measurement of customer perceived value of service, the determination of the weight of each dimension is an important problem. In order to eliminate the inaccuracy of subjective evaluation and fully embody the principle of "customer centered", we focused on weight assignment
by issuing second batch of customer questionnaires. The value of all weights is calculated by the arithmetic mean value, and the weight of each dimension of the customer's perceived value can be obtained.

\[ A_i = \left( \sum_{j}^{n} A_{ij} \right) / n \]  \hspace{1cm} (2)

In the formula, \( A_{ij} \) is the value of user \( j \), and there are \( n \) users. At this point, the calculation formula of the perceived value of power customers is shown below.

\[ PCVC = 0.33V_1 + 0.31V_2 + 0.09V_3 + 0.06V_4 + 0.21V_5 \]  \hspace{1cm} (3)

It is worth mentioning that the above weight coefficient is the current customer's general reflection value. In fact, the perceived value weight is dynamic. With the satisfaction of basic values, customers may pay more attention to the value of higher level, such as value-added services, so the weight coefficient of high level perceived value may increase.

![Figure 3. Modified structure of perceived value index.](image)

At the same time, the value of perceived value will be affected by the perceived quality of the customer. Therefore, we can further modify the evaluation index of perceived value by quantifying the effect of perceived quality on value. Perceived quality is determined by service quality, service channel, service project, feedback response and so on. The modified structure of perceived value index is shown in the figure 3.

The revised customer perceived value is:

\[ PCPV_{revised} = f(A_1, A_2, \ldots, A_n)PCPV \]  \hspace{1cm} (4)

In the formula, \( A_i \) is the index factor that affects the perceived quality, and all factors jointly form the correction factor \( f(A_1, A_2, \ldots, A_n) \) to modify the perceived quality.

The scoring method has several forms as follows:

- According to the actual situation. It is worth that: the power supply reliability rate, voltage qualification rate, and the rush time to repair the site and the service satisfaction rate are all percentage, which can be directly converted to the 1-100 interval value.

- Through the calculation and conversion. Electricity price fluctuation and electricity cost rise and fall are the base value of the above data, get the rise and fall percentage, and then convert to 1-100 interval value. PCED ranking is also calculated by calculating the rate of rise and fall, and then obtained. The number of value-added services is based on 0, and 10 is the upper limit, which is converted to a range of 1-100.

- Fuzzy evaluation. Because the quantitative calculation of the brand value is difficult at present, this index needs the customers to assign directly through the channels of sensory impression.
By obtaining the weight and score, the comprehensive score of customer perceived value can be calculated by using the customer perceived value measurement formula.

As the measure method needs to be adjusted according to the actual situation, the dynamic adjustment mechanism is formed. Generally speaking, the measurement process is shown in the figure 4.

![Flowchart of Power Customer Perceived Value Measurement](image)

Figure 4. Power customer perceived value measurement.

**Conclusion**

This paper mainly studies the measurement method of the perceived value of power customers, constructs the system of the power customer perceived value index, and USES the survey method to determine the specific evaluation indexes and weights. By measuring the perceived value of customers in different regions and analyzing the data, we can provide differentiated services and marketing strategies for customers. At the same time, the measurement and analysis results are further reported to the power grid business level, which can find the weak links in the power grid business, accelerate the formation of business innovation, thus improve customer perception, and finally improve the core competitiveness of power grid enterprises. The results of this study will support the construction of "customer-centric" service system.

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