Research on the construction of three level customer service knowledge graph

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Abstract. With the explosion of knowledge and information of the enterprise and the growing demand for intelligent knowledge management and application and improve business performance the knowledge expression and processing of the enterprise has become a hot topic. Aim at the problems of the electric marketing customer service knowledge map (customer service knowledge map) in building theory and method, electric marketing knowledge map of three levels of customer service was discussed, and realizing knowledge reasoning based on Neo4j, achieve good results in practical application.

1. Introduction

Power marketing refers to the power production, transportation and sales, and meets the power customer's economic and reasonable, safe and reliable use of electric products, and constantly improves the floorboard of a series of economic activities of the economic benefit of power enterprise. The power enterprise through appropriate and feasible marketing strategy, including quality service strategy, price strategy, brand strategy, promotion strategy and other means to continuously improve the electricity market share, in order to meet the need of customers, and to achieve the desired target for power Enterprises [1]. In current society, the role and status of power marketing is increasingly evident. Power supply electricity knowledge graph is the basis of power customers' behavior modeling, we did not find the relevant knowledge and power marketing knowledge graph from the open literature [2].Knowledge modeling and application technology based on knowledge graph theory have obtained and achieved good results the considerable development for many years at home and abroad in many industries, but in the power industry of our country, the research and application remain to be promoted. The knowledge graph can be used as the basis to explore the implicit relations among the concept terms through logical reasoning, to make the tacit knowledge explicit and to realize the sharing and reuse of domain knowledge.

Knowledge graph is an indispensable basic knowledge database for computer Natural Language Processing, semantic search, computer reasoning and artificial intelligence. But there is no public Chinese knowledge graph database, which has caused great difficulties to the relevant research. Natural Language Processing, semantic search is quite developed in foreign countries, one is easier to handle English than Chinese, and also English has many public knowledge graph database (http://www.daml.org/onto- logiest/keyword.html [3]).

With the explosion increasing of enterprise knowledge and information, and the enterprise for knowledge intelligent management and application is increasing, in order to facilitate the discovery and application of knowledge and to improve business performance, the expression and processing of enterprise knowledge have become the focus [4].

2. Related work

The concept of knowledge graph is proposed by Google in May 2012, and announced the basis for the construction of the next generation of intelligent search engine. Although the concept of knowledge graph is new, it is not a new field of study. In 2006 Berners-Lee proposed the idea of data link, thus improved the relevant technical standards, such as URL (Uniform Resource Identified), RDF (Resource Description Framework), WL (Web Ontology Language).Knowledge graph is based on the relevant research results, and it is a revolution of the existing semantic network technology [5].The knowledge graph that has been published and applied is shown in TABLE 1.

Table 1. The knowledge graph applied

	Content
Baidu knowledge graph [6]	When Baidu search some key words of public figures, there will be the relevant information of the character, the search results in the "Encyclopedia" style are displayed. But now not only search popular characters, when users search for names, subject or popular "facts", Baidu will give regular search results on the left side of the search results, and search results on the right show Baidu encyclopedia content with relevant keywords, and related search links.
Sogou cube [7]	Sogou said in its official micro-blog: in order to allow users to obtain information more easily, Sogou search released a new knowledge base search engine --"known cube". This is the first search engine in the domestic search engine industry.
Fudan GDM Chinese knowledge graph [8]	Data mining analysis of micro-blog with knowledge graph to listen to public opinion and improve people's livelihood research results, which are published in the Liberation Daily, Xinmin Evening News and other newspapers and reproduced by a number of network media.
Google knowledge graph [9]	In order to allow users faster and easier to find new information and knowledge, Google search will release "knowledge graph" to search results for the knowledge of the system, and through any key words can get a complete knowledge system.

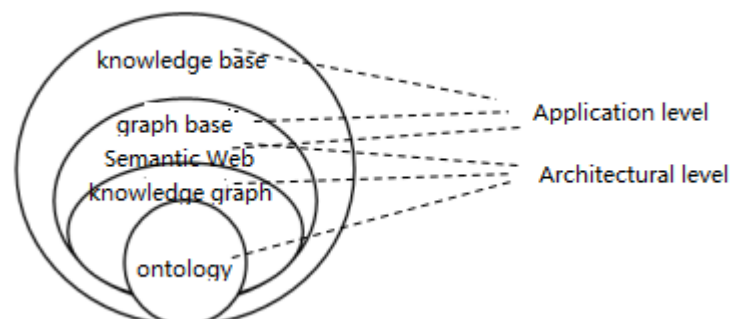The relationship between the related concepts is given in figure.

Figure 1. The relationship between related concepts

As can be seen from Figure 1, ontology and knowledge graph is the basis of the construction of knowledge system. Semantic web serves as a bridge between modeling and application. The advantages and disadvantages of ontology knowledge graph have great influence on the quality of graph database and knowledge base.

3. Three level architecture of power marketing customer service knowledge graph

3.1 Self-service architecture

Three levels knowledge graph used of power marketing customer service, providing customers with a self-service customer service system (shown in Figure 2).Realize implementation of data extraction from analysis to knowledge application.
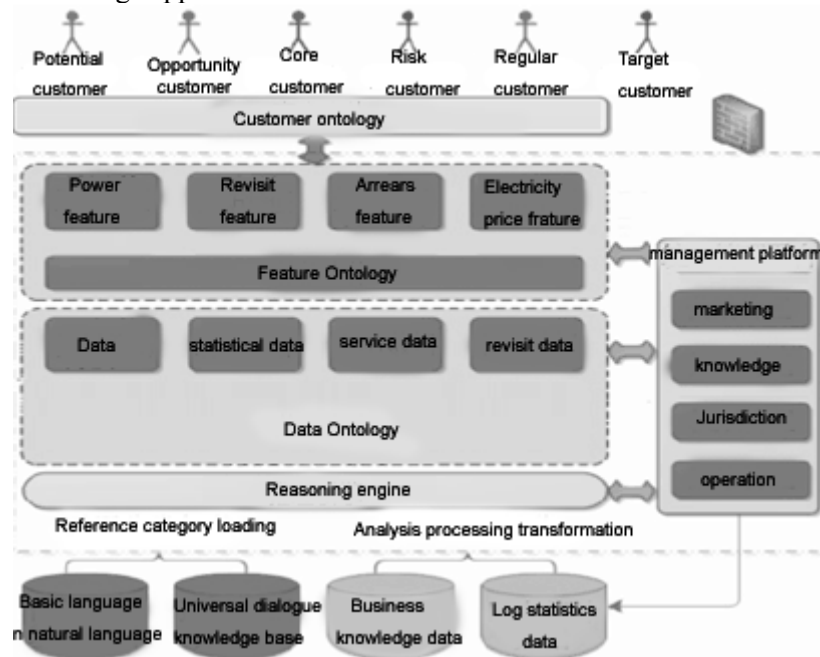

Figure 2. Self-customer service based on customer service knowledge graph

Figure 7 shows the self-service customer service system architecture can be targeted for the user's search information for context correlation, the relevant issues recommended the fuzzy intention of intelligent guidance, flexible push key business, error correction and Pinyin analysis. The main functions of the scene include business management, multi candidate output, sensitive word filtering, intelligent input, voice recognition, context, customer care etc. Self-service customer service system is low cost, 24h response throughout the day,the cost of a single service is 1/50 of an artificial hot line, the effective diversion of 10%~20% artificial seat business, and the first time diversion of the business can be maintained at more than 85%.

3.2 Application case analysis

This section mainly discusses the application of knowledge graph in power marketing customer service. Of course, many application scenarios and ideas can be extended to other industries. The application scene mentioned here is just the tip of the iceberg, and in many other applications, the knowledge graph can still play its potential value.

3.2.1 Customer value analysis. Customer value analysis is a very important link in customer service. The difficulty of analysis based on big data is how different sources of data (structured and unstructured) to be integrated together. And which build the value analysis engine, so as to effectively identify valuable customers.

A valuable customer is likely to be the beginning of a brand. A customer who has important value is the key to a brand. The reputation of customers with important value directly affects and promotes company's market influence and even market open, development. Having large customers can improve the company's market value. An account for 20% of the total number of customers brings 80% of the company's profit, which is the most important value of the customer to the company's most direct

impact on the value and benefits. In addition to the growth of corporate profits, the value of the customer has a profound impact on the company.

And the important value of the customer will involve complex network, which also brings new challenges to the value analysis. The knowledge graph, as a direct representation of the relationship, can well solve these two problems. First, the knowledge graph provides a very convenient way to add new data sources, as mentioned earlier. Secondly, the knowledge map itself is used to represent the relationship, which can help us to more effectively analyze the specific potential value of complex relationships.

Value analysis is a tool to identify the competitive advantage of enterprises. Value analysis pays more attention to the value of customer service activities. Through the analysis of customer service, the customer service activities are classified and analyzed, and the key link of customer value chain is determined, so as to establish the source of competitive advantage.

The core of value analysis is customers, first need to put all the data source associated with a particular customer to get through, and build the knowledge graph contains multiple data sources, so as to integrate into a machine understandable structured knowledge. Here, we should not only integrate the basic information (such as customer information when completing the application),can also put the customer's demand information and behavior information, value information to integrate the whole knowledge graph, thus reasoning.
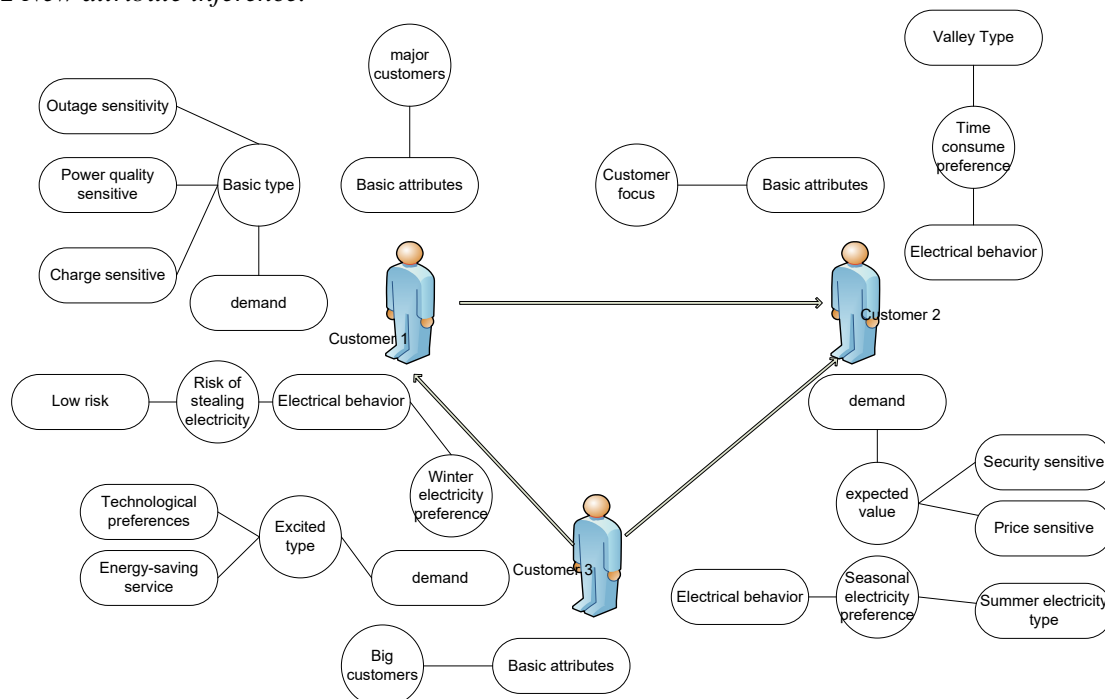
3.2.2 New attribute inference.

Figure 3. Power marketing knowledge graph reasoning

In Figure 3, the demand of customer 1 is "energy saving" and the demand of customer 2 is "billing sensitive", then we can the demand of customer 2 is also "energy saving". Customer 3's power preference is "valley power type", can also be inferred that the demand of customer 3 including "energy saving". According to the customer 2's "steal electricity risk" low and customer 3 "security sensitive", can infer that the customer 3 is a potential customers.

The self-help service system based on knowledge graph can propose current knowledge graph for user, which cannot answer content records and preliminary classification, to facilitate later artificial intervention, the hot spot cared by new users added to the existing knowledge graph. With the continuous improvement of user information in the customer service knowledge graph, according to

the operation characteristics and concerns of the user can intelligently remind the user whether needs to query often concerned content, even users can regularly push attention information, gradually play a service active perception and active service role in power marketing customer.

4. Conclusions

The knowledge graph is based on the new knowledge representation field of big data, is also the basis of constructing knowledge base. There are many challenges in the exploration and practice of power marketing customer service knowledge graph, this paper discusses three levels customers service knowledge graph framework of power marketing.

The application of knowledge graph has a certain randomness, and the interpretation of knowledge graph relies heavily on qualitative description and judgment, and cannot solve many practical problems; The mapping of knowledge graph has certain technical barriers, and it is difficult for non-experts to use it, It is a constraint factor that cannot have a significant impact on other disciplines and social fields. Although some research makes a contrastive analysis of different data, methods and tools of knowledge graph, but it did not form a specific application research standard, and the existing research results are different or even contradictory, standardized data samples set for comparative study is also a lack of.

In conclusion, the role of knowledge graph is not fully realized, and its conclusion is only auxiliary verification, and the application needs to be further strengthened; At the same time, developing in breadth, not only in the field of discipline (domain) structure visualization, but also in science and technology management and scientific decision-making, enterprise innovation and competitive intelligence play an important role. In addition, the application of knowledge graph is constrained by the improvement of its theory and software tools; It is closely related to the development of knowledge mining and artificial intelligence, and also needs to be combined with other semantic web technologies to visualize applications; Much depends on a better unde-rstanding of the human brain. In a word, go through the phenomenon of surface, it still has a long way to discover the trends and laws of subject knowledge, and to visualize visually.

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