

The Content Research and Realization Process of Product Configuration Database

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Abstract-Product configuration is an essential link of mass customization production which is developing under market-oriented economy. The realization process of product configuration has to rely heavily on the scale of database. The product configuration database proposed in this paper includes four sections: enterprise production database, customer knowledge database, configuration process constraints database and other database. In addition, the data types and realization process of the four databases are presented in order to establish product configuration database.

Keywords- product configuration; database; product information; customer knowledge; configuration constraint

I. INTRODUCTION

Mass customization (MC) is a production on mode, which provides the products and services satisfying the customer personal demands, having the low cost, high quality and high efficiency as the same as those provided by Mass Production. Along with the globalization of manufacture competition and diversification of customer demand, MC production mode is adopted by more and more enterprise, and holds the leading status gradually [1]. As the progress of MC, it is necessary to realize market dynamics, customer demand and sector demand, which make up Database needed in product configuration. Product proliferation strategies have spread widely in these last few years [2]. To a large degree, the competitiveness of the enterprise depends on its Database. But it is difficult to establish enterprise's Database. The development and maintenance of product configuration systems is faced with increasing challenges caused by the growing complexity of the underlying knowledge bases [3]. The acquisition progress of knowledge of database must be very reasonable and efficient.

II. PRODUCT CONFIGURATION DATABASE

Various kinds of data should be stored in special way and be available to multiple users. Database is a warehouse in which the data is organized, stored and managed according

to data structure. But the requirements presented by product configuration are extremely high to the database. In general, product configuration database includes at least the following aspects:

A. Enterprise product database

What the product design experience is huge treasure to enterprise. Its product information should be included in product configuration database so that enterprise can adjust design to satisfy the customer different demands. Mature product model must be contained in database especially for manufacturing enterprise. It is up to richness of the model that the diversity of customer chosen. In recent years, product design collaborated with customer is based on perfect enterprise product model database.

B. Customer knowledge database

The traditional large-scale vertically integrated product development mode is being replaced by the commonwealth consisting of customer, suppliers and manufacturing enterprises. In order to innovate product and combine customer knowledge into product innovation, the enterprise should make full of using customer knowledge and enterprise knowledge.

C. Configuration process constraints database

It is necessary to consider the various restrictions during product configuration process, such as costs, materials and benefits, etc. All these restrictions not only influence production at the present stage, but also influence enterprise's subsequent development and production types. Constraints and mathematical configuration algorithm should be combined together. In general, configuration process is controlled by practical constraints through algorithm.

D. Other database

Product configuration database coverage should be wide enough and should include other aspects which affect product configuration besides those three mentioned

database, such as national laws and regulations, industry production institution and market economy criterion.

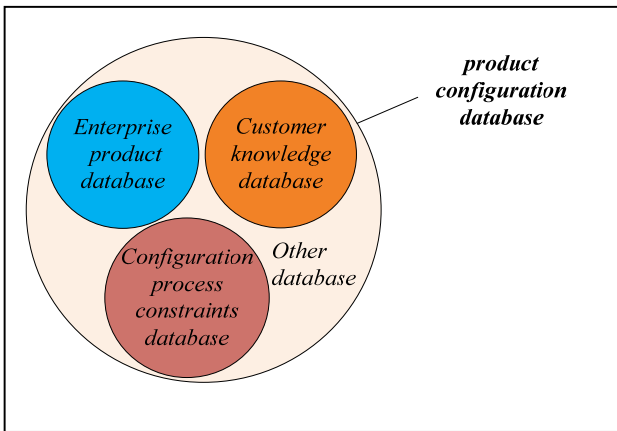


Figure 1. Contents of product configuration database

Contents of product configuration database are just like in Fig.1.

III. ESTABLISHMENT OF ENTERPRISE PRODUCT INFORMATION DATABASE SELECTING A TEMPLATE

Enterprises will accumulate a lot of experience during the process of maturation and development. With the richness of enterprise product, its database which is constituted by product information will be abundant and become important enterprises treasure. Enterprise product information database includes product series model, product function information table, product material machining process information, digital product model information, product marketing information, etc. This information relates to all aspects from product design to sale even the aftermarket. Improved information database can accelerate the development of new products, which helps enterprise adapt to the change of market, so as to meet customer need better, increase enterprise market share.

Product information is usually in the messy state. Therefore, the first step to establish a database is to filter useful information, then sort and collect. Compared to customer, employees are more being of organization and discipline, which provides better convenience to collect information. Enterprise can set the rules and standards on information expression, for instance, a wide variety of information can be expressed in a unified pattern. Enterprise culture, enterprise system, product technology, etc., all of these are important parts of information database.

In order to invoke the information in the following product innovation and design products with customer, enterprise need to classify and store the information after collecting complete product information. It would be specially mentioned that it will make great difference on improving enterprise market competitiveness that standardizes the exchange of information within the enterprise. There are two common types on information storage accumulation and preservation: information storages and information maps. Information storages include not only

the entries and content of product information, but also the environment that the information used in. As for the information maps, its feature is information storage which is combined with product development life cycle.

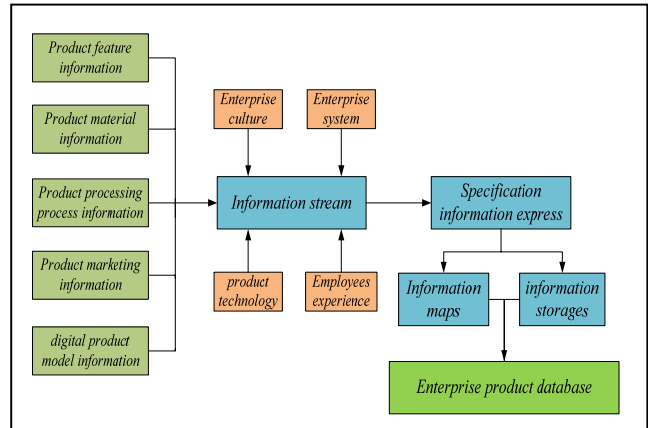


Figure 2. The establishment of the enterprise product database

The establishment of the enterprise product database can be expressed in figure 2.

IV. ESTABLISHMENT OF CUSTOMER KNOWLEDGE DATABASE

Customer knowledge is dynamic combination of experience, values, contextual information and expert insight which is produced and processed during the progresses of trade between customer and enterprise [7]. Customer knowledge is created by enterprise and customer common intellectual labor, and it is integrated into knowledge of enterprise product innovation [8]. In addition, customer knowledge is generated in exchange and fused together in a network environment, which is mainly including basic customer information, customer dominant or tacit creative knowledge, customer demand, etc.

A. Customer knowledge type

Customer knowledge is important treasure to enterprise, which is also an important part of enterprise knowledge [4]. In customer knowledge management, there are four main types of customer knowledge:

- About customer knowledge: Such knowledge is about the description of the customer basic situation, including customer humanities statistical information, historical purchase information, hobbies and the record of their use of product and service, etc. This knowledge mainly comes from structured data generated from transaction process, most of which is explicit knowledge and the cost of business acquired is relatively lower.
- Knowledge customer need: Such knowledge refers to the knowledge that enterprise prepares to meet customer needs. This knowledge is provided to customer by enterprises, including enterprise's product service and market conditions, etc.

Knowledge conveys from enterprise to customer, so as to help customer have a better understand of enterprise's product and service. This knowledge also gets customer need match enterprises' product more effectively. How to make this kind of knowledge not only be widely accepted by customer, but also provide appropriate knowledge for each customer pertinently, and it is the emphasis of such knowledge to balance between breadth and accuracy management.

- Knowledge comes from the customer: Such knowledge is feedback information which describes the situation about customer favor on enterprise competitors' product and services. During the interactive process between customer and enterprises, the customer feedback information about perception and experience on the product or service is an important resource for enterprise. It helps enterprises to improve the quality of products and services, to have better market segments, as well as to establish appropriate strategies and tactics.
- Knowledge created together: Such knowledge is created by enterprise and customer together, but current literature pays little attention on it. It mainly comes from the process of cooperation between enterprises and customer. Enterprise regards customer as companions with whom to work together to create knowledge and it can achieve the purpose of knowledge innovation in interactive process. Research about enterprise innovation shows that, lots of knowledge and innovation is created by enterprise and customer. Therefore, enterprises should be active on listening customer's suggestions and comments, communicating with each other, and discovering and excavating the customer real needs.

B. Establishment of customer knowledge database

It's very complicated to establish a customer knowledge database and many factors such as knowledge acquisition, knowledge representation, knowledge storage and knowledge invoke must be taken into consideration [5]. The first step is customer knowledge acquisition and conversion. Customer knowledge is an important information stream. The process of knowledge acquisition is to extract useful information into a data model which can be expressed through certain form. Customer knowledge can be divided into dominant part and tacit part. The second step to acquire knowledge is to transform needed knowledge into a special form which can be discovered and excavated by a certain method. OLAP (On-Line Analytical Processing) and DM (Data Mining) are two important feasible methods. Then, we need a special language to describe customer knowledge and the structure of it. The common knowledge representation methods are polychromatic graph theory [6] and UML (Unified Modeling Language). The value of different customer knowledge is not the same which should be evaluated and integrated based on knowledge level, direction, value. After integrating, knowledge is stored into customer

knowledge database. At the same time, the rules and invoke program for database must be developed in order to make use of database safely.

The process of establishing customer knowledge database can be expressed by the following pictorial representation like Fig.3.

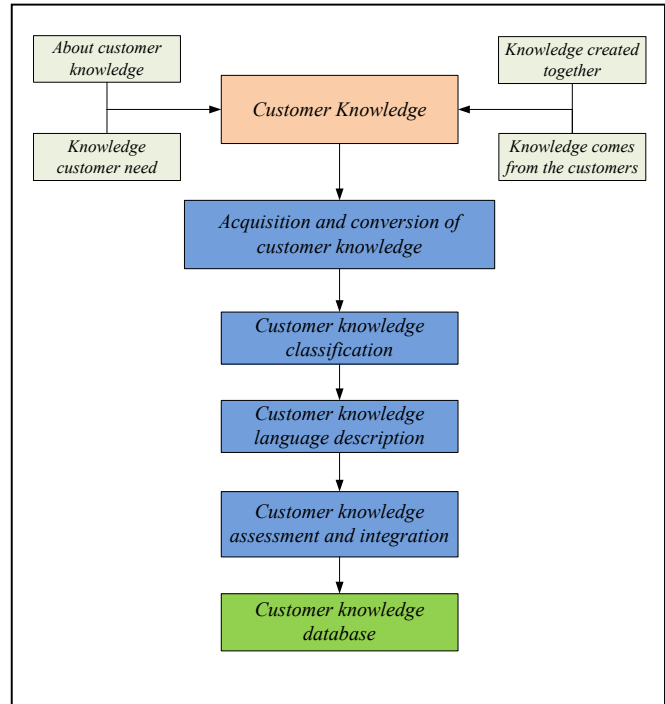


Figure 3. Diagram of customer knowledge database established process

V. ESTABLISHMENT OF CONFIGURATION PROCESS CONSTRAINTS DATABASE

In order to ensure the product functions and enterprise's economic benefits, product configuration is based on a certain constraint and needs to follow certain principles. Configuration process is an important part of production. Different products and industry vary greatly in specific conditions. But the configuration process constraints database at least contain following constraints just like in Fig.4:

A. Safety product constraints

Product configuration process should ensure the safety of personal, enterprise assets and social natural environment. Once accident happened, the consequences would be unthinkable and the losses will be huge. So, Safety product constraints are the most important factors.

B. Cost constraints

The purpose of enterprise production is profit. Production cost should be controlled with a reasonable range and consider long-term interests for both society and enterprises. So, cost constraints are the most immediate factors.

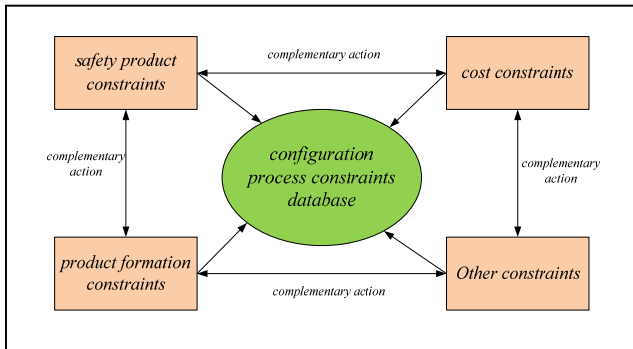


Figure 4. Contents of configuration process constraints database

C. Product formation constraints

Different product configuration process corresponds to their special constraints and rules. In order to ensure production being efficient and qualified, product configuration process should take full account of product physical structure, product mechanism, external characteristics and other aspects of constraint.

All these different aspects don't work alone; they work complementarily to guide production configuration process. Configuration process constraints generally exist in product configuration database in the form of mathematical constraint function.

VI. OTHER DATABASE

Many factors such as production, sales and service, are linked with social inextricably. As a part of the society, product is also affected by many social factors. Production behavior should be carried out under laws and regulations. At the same time, it should correspond in industry rules of conduct. Enterprises behavior and the value of the product are affected by the economic rules; enterprises should adjust the scale of production and configuration when market and economic condition change. Anyway, enterprises product configuration should consider many factors, and all these factors should go into the other database.

VII. CONCLUSIONS

Establishing a database is an important part of the product configuration process. Establishing an improved database is not only capable of directing production, but also bringing good economic and social benefits. Enterprises product database, customer knowledge database, configuration process constraints database and other database, they form the product configuration database. To establish a database, we must ensure being rich in staff experience and data. The process of establishing a database is developing with products production.

ACKNOWLEDGMENT

The research work presented in this paper is supported by grant "Key techniques research of the overall design of deep-water semi-submersible platforms", funded by the ministry of industry and information technology Fund in 2012.

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