The Technology Study of Acquisition and Analysis Customers' Clothing Requirements Based on QFD Method

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Abstract

This paper puts forward an analysis method of the customers' clothing requirements based on the Quality Function Development (QFD) method.It discussed the reasoning procedure and process from the perspective of customers' clothing requirements and the analysis to putting forward the clothing design scheme by the QFD method, and then combined an example of the ONLY leisure suits to verify the validity of the method.The example of the ONLY leisure suits verified the validity of the method and the study of this method can provide a reference to garment customization. It proved that the analysis method of customer' demands based on QFD can be closed to the customer' clothing demands, and it can improve the customers' satisfaction and brands' reputation.

Keywords: Customers' Demands, QFD, Analysis

1. Introduction

The concept of customers' demand is defined as: Customers express demands for garments in their own languages. Customers' demands are the foundation of costume design strategy, and are the basis of clothing design in clothing enterprises.

Theory and application research proves that design and produce the clothing which welcomed by the customers, we must firstly ensure that the messages we collected reflected the needs of most users. Enterprises should try their best to collect original customers' requirement information through all kinds of investigations method. However, it is difficult to identify the hidden, potential demands of customers and to combine them with design, then to prompt the product development, innovation and continuous improvement with the ″QFD ″（ Quality Function Deployment)″ [1] method, we can extract the customer demands more accurately. In this paper, we take ONLY (the famous leisure suit brand) as an example to obtain and analyze customer demands in order to verify the effectiveness of this method.

2. The Characteristics of the Customers' Clothing Demands

Like other products, personalized needs of clothing products are the main characteristics of customers' clothing demands. The personalized demands mainly include two features: Diversity and Changeability. The diversity requires the clothing product in variety, and small quantity, even single; the changeability requires the clothing update frequently so that shortens the life of clothing market.

As one word, the customers' clothing demands have the characteristics of fuzziness, changeability and diversity [2].

(1)The fuzziness of the customers' clothing demands. Fuzziness is the uncertainty of customer demands, and is the basic characteristics of the customers' demands. Firstly, different customers' descriptions of the clothing use different metrics, and are mainly based on their judgment of perceptual knowledge, so the result is uncertain. Secondly, different customers come from different knowledge structures, different social classes, and even different countries, have different judgments even for the same clothes, the results are also different. Finally, the customer demands of clothing are often vague descriptions, which need professional designers' analysis, then be adapted to guiding the design.

(2)The variability of the customers' clothing demands. The variability of the customers' clothing demands shows the changing customer requirements. Once new customer demands are brought up, the design of clothing must be updated in time. According to the variability of the customers' clothing demands, the enterprise should not only consider the design satisfied the current customers' demands, but also meet the needs of customers for a period of time in the future, so that the clothing designed by the customer' clothing demands have a potential market in the future.

(3)The diversity of the customers' clothing demands. Under the condition of oversupply in the clothing market, the customer demands have the characteristics of diversity. In content, the customers' clothing demands include quality, packaging, brand, features, design and so on. In the process of customer-made, it is a huge challenge for the enterprise using the limited ability to meet the diversity of the customers' clothing demands since the customers join the design themselves.

The leisure suit belonging to the scope of mass customization, to some extent, apparel mass customization and personalized customer needs are mutually contradictory. Therefore the intersection between the individual demands and mass customization particularly need to be analyzed, which make mass customization meet the requirement of customers at the same time.

3. The Analysis Method of the Customers' Clothing Demands Based on QFD

In the field of garment, the ways of collecting information about the customers' clothing demands mainly include: (1) the questionnaire; (2) information after sale service; (3) previous product order data analysis; (4) relevant trend information from home and abroad.

With the development of the Internet, the online survey is becoming the economical and effective method to collect information about the customers' clothing demands. There are mainly two methods to gain the information about demands based on web: firstly, through the human-computer interaction model, the advantage is that we can obtain the information accurately, while the disadvantage is poor initiative. Secondly, through the data mining of customer visit records, we can access to the customers' basic needs, design habits and personal preferences, etc.

After gaining the information about the customers' clothing demands through the above channels, it is necessary to classify and analyze the original demands of these customers, forming a systematic, hierarchical, organized table about the customer demands, and weight the importance of the customer demands.

The clustering technique of customer based on fuzzy clustering analysis [3], divide the customers into groups based on the similar demands, then form a number of customer groups, and take different product strategies in each customer group to meet the apparel customers' demands better. In fact, this kind of cluster makes the discrete customers re-cluster according to similar demands. The internal driving factors of exploring similar demands of customers clustering into the group develop the potential needs of this customer group at a higher and more abstract level. According to the objective existence of similarity, such as the natural environment, economic level, customer property, purchasing power, we can define and describe the customers reasonably, and give the weight value.

The implement method is generally divided into two steps: one is the extraction of customer demands, the second is the decomposition of customer demands (shown in figure 1) whose core content is the Quality of House (HOQ, House of Quality).
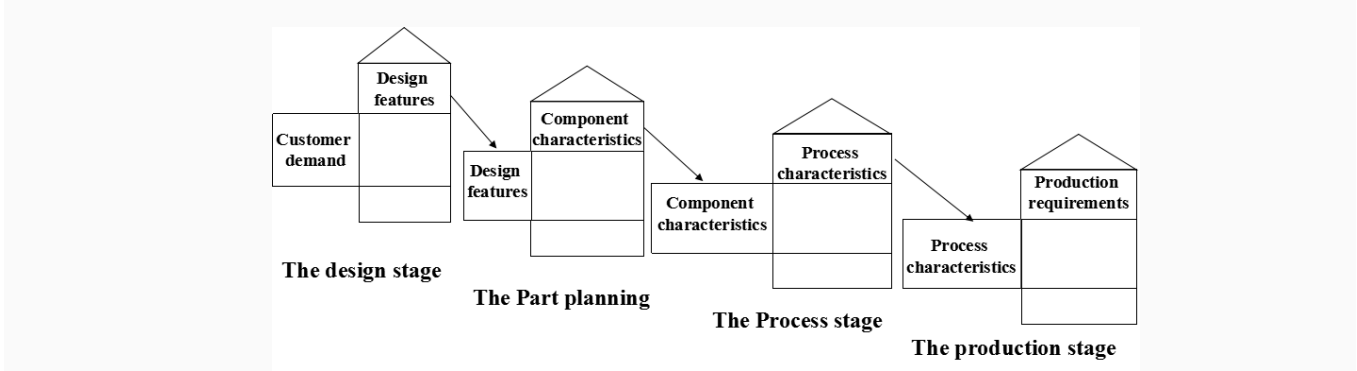
Figure 1: The Process of QFD

The Quality of House [4] is put forward by the American scholar J.R.H auser and, D.Clausing [5] in 1988. This paper inject the reference to analyze the customers' clothing demands, in order to determine which design features of clothing products are important to the customers' clothing demands. The Quality of House in the design stage is shown in figure 2:
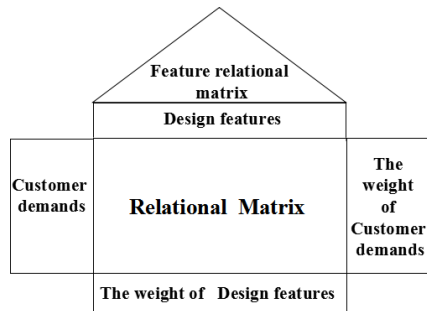

Figure 2: The Quality of House in the Design Stage

The left wall of the Quality of housing (HOQ) is "customer demands " list and the right wall is "the weight of customer demands". There are i "customer demands " and " the weight of customer demands ".The Ceiling of the Quality of housing is "design features" list while the floor is " the weight of design features ". There are j "design features" and "the weight of design features ". The Quality of House is the "relational matrix" between "design features" and "customer demands ", the j element and the i line of the matrix means the j design features' impact on the i customer demands. The roof of the Quality of House is the "feature relational matrix "between two (or more) "design features". Based on "the weight of customer demands " and "relational matrix", we can get "the weight of design features "by the weighted sum method.

4. The Quantitative Mapping from "Customer Demands" to "Design Features" of QFD in Leisure Suit

QFD technologies is adopted in the apparel design stage, using the Quality of House as a tool, transform qualitative and vague customer demands to the characteristics, accurate engineering language so that realize the quantitative mapping from "customer demands" to "design features".

4.1 The Determination of "Customer Demands" and "the Weight of Customer Demands".

Usually, in the process of building the Quality of House, "customer demands" and "the weight of customer demands" in casual suit are determined from the following steps:

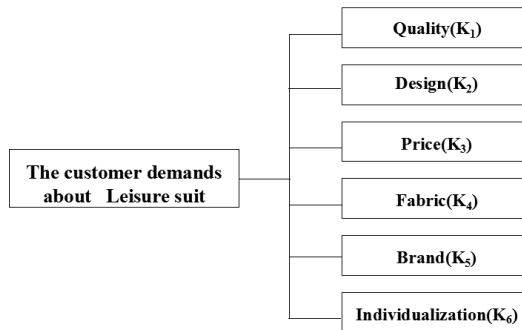(1) Determine the "customer demands " $K_i \ (i=1,2,...,m; m=6)$, as shown in figure 3.

Figure 3: The Customer Demands about Leisure Suit

(2) Determine "the importance of customer demands" $x_i \ (i=1,2,...,m; m=6)$. Generally, we first do the questionnaire survey, and then compare the selected times of the customer demands, and get all the importance of customers' demands x_i. The more times customer demands are selected, the more importance it is. We set "the importance of customer demands" as 5 levels [12]. According to the values in table 1, the greater the value x_i is, the more important it shows.

Table 1: The Importance of Customer Demands

x_i	Meaning
1	The demand doesn't affect the realization of the function
2	The demand doesn't affect the realization of the main function
3	The demand affects the realization of the main function littlely
4	The demand affects the realization of the function importantly
5	The basic, safely, particularly important demand

(3) Calculate "the weight of customer demands " q_i. This article uses the average method [12] to calculate" the weight of customer demands" q_i, as shown in type 1:

$$q_i = x_i \bigg/ \sum_{i=1}^{m} x_i \qquad\qquad (1)$$

4.2 The Determination of "Relational Matrix" between "Customer Demands" and "Design Features"

1) According to customer demands of casual suit, we determine the design features of the clothing products H_j; as shown in figure 4:
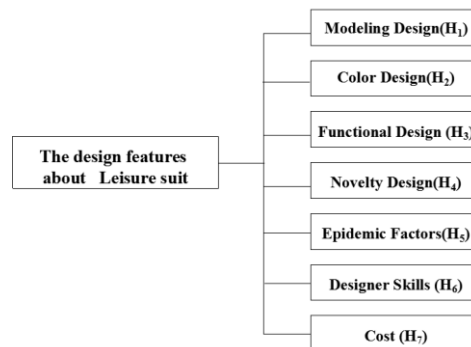

Figure 4: The design features of Casual Suit

2) Through professional interview and research team discussion, further determine the relational matrix R_{ij} between design features H_j and customer demands K_i.

Use the four grades: strong correlation, related, the weak correlation, independent in characterization shows the influence degree of the relational matrix, as shown in table 2. The assignment of the matrix is determined by expert scoring.

Table 2: The Influence Degree of the Relational Matrix

R_{ij}	Meaning
Independent: 0	The intersection point of the technical measures and customer requirements are Independent.
The weak correlation: 1	
Related: 3	The intersection point of the technical measures and customer requirements has the weak correlation.
The strong correlation: 9	
	The intersection point of the technical measures and customer requirements are related
	The intersection point of the technical measures and customer requirements has the strong correlation.

4.3 The Determination of "Feature Relational Matrix"

This paper uses "the degree of association" to express the relationship between the design features H_j in the"Feature relational matrix". They are divided into the strong positive correlation, weak positive correlation, strong negative correlation and weak negative correlation, symbolically, ◎、○、×、#. If there are no relevant, no symbolic represented.

4.4 The Determination of "The Weight of Design Features"

By calculating weighted sum to calculate "The weight of Design Features"w_j" shows in type (2). If the j design features are closely associated with the customer demands, and the customer demands are more important, the w_j will be larger; it means the design feature is more important:

$$w_j = \sum_{i=1}^{m} q_i R_{ij} \quad (i=1,2,...,m; j=1,2,...,n;^1 m=6, n=7) \qquad (2)$$

The determination of "Feature relational matrix" take the the design features into consideration. Therefore it is objective and scientific.

After building House of Quality establishes the "relationship matrix" between customer demands and design features, we should have comprehensive evaluation to the design. Every design has its special characteristic which makes up different plan, as well as the basis of evaluation. Before program evaluation, determining design characteristic is the conference of the comprehensive evaluation.

5. The Example of ONLY (Leisure Suit Series)

This paper handed out questionnaire about the consumer demands in leisure suit to Shanghai consumers and collected 650 printed and electronic questionnaires. The survey is mainly based on working-class and students between 18 to 35 years old, respondents in the majority with young women, 61% of the total.

Research result shows that, when customers are buying casual suits, the style and quality are taken into consideration in majority, 27% and 22% respectively; the second concern is the price and fabric, 18% and 15% respectively. Figure 5 shows the percentage of the consumer demands K_i; Table 3 shows the important degree of customer demands x_i and the weight of customer demands q_i ($i=1,2,...,6$) .
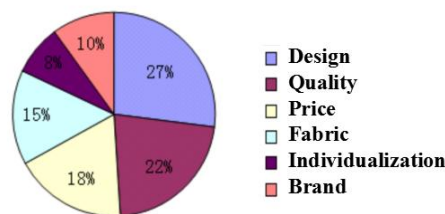

Figure 5: The Percentage of the Consumer Demands in Leisure Suit

Table 3.The Importance of Customer Demands and the Weight of Customer Demands

Customer demands K_i	The importance of Customer demands x_i	The weight of Customer demands q_i
	5=extremely important,1=extremelynot important	$q_i = x_i \Big/ \sum\limits_{i=1}^{6} x_i$
Design	5	5/23
Quality	5	5/23
Price	4	4/23
Fabric	4	4/23
Individualization Brand	3	3/23
	2	2/23

According to the above customer demands, we determined the design features, building the quality of house, and got the relational matrix R_{ij} ($i=1,2, ..,6; ....$) between the design features H_j and the customer demands i , such as type (3).

$$
\mathbf{R} = \begin{bmatrix}
9,3,9,1,9,9,9 \\
9,9,3,9,3,3,9 \\
9,3,3,3,3,1,3 \\
3,1,3,3,1,3,3 \\
1,1,1,1,1,3,3 \\
3,3,3,3,1,1,1
\end{bmatrix} \tag{3}
$$

By type (2), we can calculate the weight of design features w_j:

$$
w_1 = \sum_{i=1}^{6} q_i R_{i1} = \frac{5}{23}\times 9 + \frac{5}{23}\times 9 + \frac{4}{23}\times 9 + \frac{4}{23}\times 3 + \frac{3}{23}\times 1 + \frac{2}{23}\times 3 \approx 6.4
$$

$$
w_2 = 3.7\,, \quad w_3 = 4.0\,, \quad w_4 = 3.6\,, \quad w_5 = 3.5\,, \quad w_6 = 3.8\,, \quad w_7 = 5.4
$$

Figure 5 shows the quality of house in the design stage .Based on"The weight of Design Features",we ordered the elements of design requirements, and determined the design is the main design element in customer demands, the second is the cost, and then the functional design, so on.

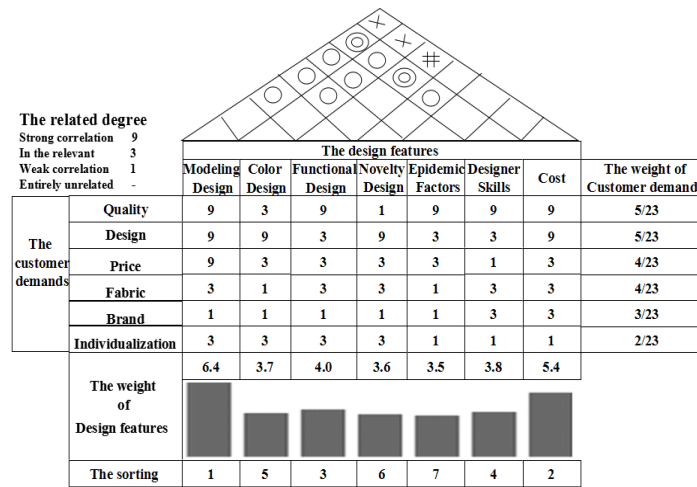| The related degree		Modeling Design	Color Design	Functional Design	Novelty Design	Epidemic Factors	Designer Skills	Cost	The weight of Customer demands
Strong correlation 9				The design features					
In the relevant 3									
Weak correlation 1									
Entirely unrelated –									
The customer demands	Quality	9	3	9	1	9	9	9	5/23
	Design	9	9	3	9	3	3	9	5/23
	Price	9	3	3	3	3	1	3	4/23
	Fabric	3	1	3	3	1	3	3	4/23
	Brand	1	1	1	1	1	3	3	3/23
	Individualization	3	3	3	3	1	1	1	2/23
The weight of Design features		6.4	3.7	4.0	3.6	3.5	3.8	5.4	
The sorting		1	5	3	6	7	4	2	

Figure 6: The Quality of House in the Design Period

Further we built the quality of house in the part planning, forming the "relational matrix" between the "design features" and the "component characteristics".

In the matrix, the component characteristics of casual suit are defined as style types, such as mix collocation (including tops, bottoms and jewelry), combination suit, general suit, etc. We also made the related level in the relational matrix, and calculated the weight of each style type. Through the "relational matrix" between the "design features" and the "component characteristics", we found the mix collocation is the most important factor in the part planning.
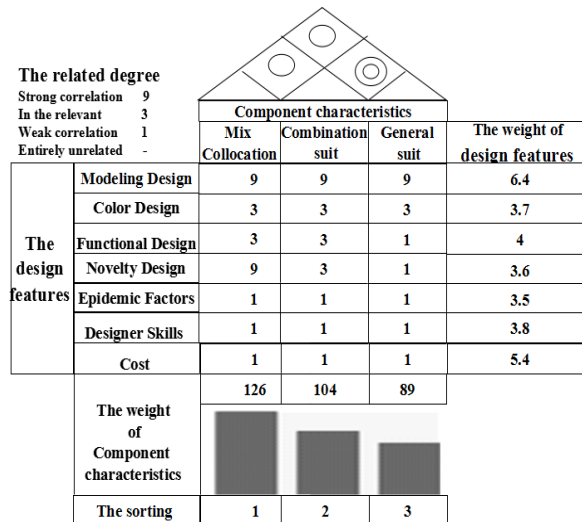

The related degree
Strong correlation   9
In the relevant   3
Weak correlation   1
Entirely unrelated   -

		Component characteristics			
		Mix Collocation	Combination suit	General suit	The weight of design features
The design features	Modeling Design	9	9	9	6.4
	Color Design	3	3	3	3.7
	Functional Design	3	3	1	4
	Novelty Design	9	3	1	3.6
	Epidemic Factors	1	1	1	3.5
	Designer Skills	1	1	1	3.8
	Cost	1	1	1	5.4
	The weight of Component characteristics	126	104	89	
	The sorting	1	2	3	

Figure 7: The Quality of House in the Part Planning

By adopting the technology of QFD, we can continue to determine the "relational matrix" between the "component characteristics" and the "process characteristics" in the process stage and the "relational matrix" between the "process characteristics" and the "production requirements" in the production stage (shown in figure 1), then design and produce the leisure suit meeting the consumers'demands.

Through the analysis of the customer demands of the casual suit in this case, it proves the casual suit of ONLY how to meet the demands of women consumers in Shanghai.

ONLY is one of the well-known brands undered the Danish international fashion company BESTSELLER. The designers of Bestseller spread all over the Europe, standing at the top of the world fashion trend and create super fashion for the young people in the metropolis.

It came to China in 1996, and gave Chinese a vigor and free way of life. ONLY clothing includes: coats, jackets, sweaters, knit tops, t-shirts and other accessories, such as backpacks, hats, gloves. When it brings the world of fashion, at the same time, it also brings the world-class quality and service. It aparts from the high prices of other international famous brands, adopt the reasonable price. It increases the craft of "mix collocation ", richs the changeful and colorful fabric, meets the deep demands of customers, improves the rates of leisure suit in the clothing market.

6. Conclusion

(1) This article researched the web-based analysis method of the customers' clothing demands .It is discussed from the analysis of customer demands, to the costume design steps and process. In this way, we can map the customer demands to scientific and reasonable apparel demands, and design the clothing meeting customer demands.It has theoretical significance and practical value at the high-speed society.
(2)The customers' clothing demands have the characteristics of fuzzy, changeability, diversity, so this article used the QFD technology, transformed the qualitative customer demands, to the characteristics, accurate engineering language, and realized the quantitative mapping from "customer demands to "design features" .The system can reflects the customer demands in the product life relative accurately.
(3)This paper took the ONLY as an example, proved that the analysis method of customer demands based on QFD can be closed to the customers' clothing demands, and can improve the customers' satisfaction and brands' reputation.

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