

Development of bamboo Chair Products with Quality Function Deployment (QFD) Method (Case Study: UD. XYZ)

I.M. Suartika, A. D. Catur

Mechanical Dept. of Engineering, Faculty of Engineering, Mataram University, Lombok, Indonesia
Corresponding Author: imadesuartika@unram.ac.id

ABSTRACT: Consumer demands for quality products require the industry to look for ways to develop products to satisfy consumer desires. This study was conducted to determine the needs and desires of consumers (customer needs and wants) for the quality of bamboo chair products. The method used is Quality Function Deployment (QFD) to identify consumer desires (Voice of Customer). Voice of customer was obtained through the distribution of questionnaires to 90 respondents from consumers of three small industries studied, namely; UD. XYZ, ABC, and FGH. The distribution of questionnaires is carried out to determine the level of consumer interest in a product, so that the industry can develop new products that are in accordance with consumer desires. Based on the interests and desires of consumers towards bamboo chair products, two new designs were produced. The results of research on three designs, namely the old design (D0) and two new designs (D01) and (D02) showed that the most in demand by consumers was the new chair design (D02), with an average value of 4.26, and the least desirable was the old chair design (D0) with an average value of 3.54. So that the development of bamboo chair products based on priority for improvement is the finishing process with priority 5.7, strength value with priority 2.5, age with priority 1.9 and those with the lowest priority value are color variations with a value of 0.9.

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I. INTRODUCTION

Small industries in Indonesia are an important part of the national economic system, because they play a role in accelerating equitable economic growth through the mission of providing employment, increasing people's income and playing a role in increasing foreign exchange earnings and strengthening the national industrial structure. [1] In quantitative terms, business actors in Mataram-Lombok-Indonesia City were handicapped by 1756 units. Of these, 99.9% are small and medium enterprises (SMEs), while large enterprises are only 0.005%. With that dominant number, SMEs are able to absorb 99.45% of the entire national workforce. From this percentage, it can be said that small and medium industries are sectors that need to get top priority in Indonesia's economic development.

One of the small industries that needs attention from the West Nusa Tenggara (NTB) Provincial government is bamboo handicrafts. One of the products of bamboo crafts that are in great demand is bamboo chairs. UD. XYZ is one of the bamboo craftsmen in Gunung Sari Village-Lombok-NTB. From preliminary studies conducted on the manufacture of bamboo chair products, craftsmen experienced difficulties in developing designs and models that were in accordance with consumer wishes. So that the design and model produced are not in accordance with consumer wishes. It can be said that the level of understanding of consumer demands that are global industrial is still very lacking. So it is necessary to improve product quality in accordance with consumer needs in order to compete in the market. One way for products to be produced in accordance with consumer wishes is the Quality Function Deployment (QFD) method.

[2;3] QFD is a method for structured product planning and development that allows the development team to clearly define customer wants and needs, and then evaluate the product with systematic capabilities to meet customer desires. QFD is an act to design processes to respond to customer needs and expectations. QFD is an action that guides the improvement of enabling processes of an organization to meet customer satisfaction [4]. With QFD, it is expected that the factors that become consumer desires become the main basis for product development, because consumers are users of the products produced by the company.

[2;5;6] The main tool used in QFD is the "House of Quality". HOQ (House of Quality) shows the relationship between consumer needs translated into technical attributes, so it can be said that HOQ is the core of QFD. The QFD process consists of one or more quality matrices [2;7;8]. The first matrix is named the House of

Quality (HOQ). The HOQ matrix consists of several matrices combined where each matrix contains information that is interconnected between one matrix and another.

▪ **Voice of Customer Classification of Customer Needs**

There are two ways to measure the importance of customer needs and desires (attributes), namely by asking directly to customers or by guessing the importance of other data.

▪ **Qualitative Data Collection**

To make design decisions that are tailored to customer needs, product developers should understand the true wants / needs of consumers / customers. In qualitative data collection can be done by means of interviews.

▪ **Affinity Diagram**

Affinity diagrams are tools used to identify qualitative information. The source of ideas in affinity diagrams comes from internal and external sources.

▪ **Developing Quality House**

The most appropriate order in building a "Quality House" is as follows:

1. Phase I Customer Needs Matrix.
2. Phase II Planning Matrix.
3. Phase III Technical Response.
4. Phase IV Determining the Relationship of Technical Response with Customer Needs.
5. Phase V Technical Correlation.
6. Phase VI Benchmarking and Target Setting.

▪ **Technical Response/ Substitute Quality Characteristics (SQC)**

In bringing up this SQC there are several ways, namely Performance Measurement, Product Function, Process Step. This stage is decisive for the next steps.

▪ **Planning Matrix**

1. Once an affinity diagram is formed, the data is ready for quantification.
2. The data required are: The relative importance of these needs. The level of customer satisfaction performance for each need.
3. The level of competition performance customer satisfaction for each need.

Quantitative data collection, is the stage of the QFD planning matrix because here it will be known, how consumers prioritize. The planning matrix consists of seven different types of data, each of which will be described differently. The seven data are: Importance to Customer, Customer Satisfaction Performance, Competitive Satisfaction Performance, Goals / targets to be achieved, Improvement Ratio, Sales Point, Raw Weight, Normalized Raw Weight.

▪ **Benchmarking**

Benchmarking is a systematic way to identify, understand, and creatively create the development of products, services, equipment design, processes and applied to improve the performance of a company.

Based on the descriptions that have been stated above, the problems faced by SMEs, especially UD. XYZ is a difficulty in design development that refers to consumer desires. Therefore, to develop products that suit consumer wishes, the QFD method is used. The purpose of this study is to determine the process of product design and development that pays attention to consumer needs and wants (customer needs and wants) and develops initial designs to get designs that suit consumer desires.

II. STUDY METHOD

The steps carried out in the study are as follows:

I. Field study.

II. Literature study.

After conducting field studies and literature studies, the next thing to do is:

1. Identification of Research Variables.
2. Identification of research samples.
3. Qualitative Data Collection and Processing.
4. Quantitative Data Collection and Processing.
5. Determination of population, sample frame.
6. Determination of Data Collected.
7. Testing of Questionnaire Data.
8. Build QFD Quality House.
9. Relationship Matrix between SQC and Customer Needs.
10. Technical Correlation.

To find out the number of samples in this study, the equation used is the Slovin / Yamane equation as follows:

$$n = \frac{N}{Nd^2 + 1}$$

Where: N is the Population; n is the Number of samples; d is Trust level.

Data processing is carried out using Excell software and SPSS vs 16.0 to simplify the process and so that the results obtained are more accurate. From the results of SPSS calculations, validity and reliability tests will be obtained.

▪ **Validity Test**

The validity test aims to find out these variables are able to influence the results of the study, or in other words whether the variables are able to show what should be shown. The calculation of validity can be calculated using the following formula:

$$r = \frac{N(\sum xy) - (\sum x \sum y)}{\sqrt{[N \sum x^2 - (\sum x)^2][N \sum y^2 - (\sum y)^2]}}$$

Where: X is the score of each variable; Y is the total score of each variable; N is Number of respondents.

▪ **Reliability Test**

Reliability tests are used to test the accuracy of measurement results that are closely related to trust issues. This test is carried out using SPSS 16.0 software, or can be calculated using the following formula:

$$R_{tt} = \frac{M(V_t - V_x)}{M - 1 (V_t)}$$

Where: M is the Number of grains; Vt is Total variance; Vx is Variance of grains.

III. RESULTS AND DISCUSSION

The bamboo chair attribute data in table 1 was obtained from the distribution of the initial questionnaire in the form of customer phrases.

Table 1. Bamboo Chair Attribute Data

<i>Customer Requirements (WHATs)</i>	
Design	Strong and lightweight construction
	Trendy model/design
Estetic	Natural colors
	Smooth and neat surface finish
	Strong and neat joints
Comfort	Comfortable to sit on
Warranty	Not weathered by insects and fungi
	Durable surface coating (varnish)

The results of the distribution of formal questionnaires obtained data on the average importance of each attribute, the average value can be seen in table 2.

Table 2. Average value of Attribute Importance to Customer Scale

No	Attribute	Scale of Importance	Order of Importance
1	Strong and lightweight construction	8,422	2

2	Trendy model/design	7,933	5
3	Natural colors	7,5	8
4	Smooth and neat surface finish	8,255	4
5	Strong and neat joints	8,355	3
6	Comfortable to sit on	8,433	1
7	Not weathered by insects and fungi	7,922	6
8	Durable surface coating (varnish)	7,588	7

Based on consumer voices from the table of average values of consumer importance, the company needs to make a technical response which is a technical ability possessed by the company to meet customer needs. The Technical Response on bamboo chair products that looks like in table 3 is:

Table 3. Technical Response

No.	Technical Response
1	Strength
2	Fineness
3	Color variations
4	life of product
5	Model variations
6	bamboo diameters
7	bamboo thickness
8	Main and supporting materials
9	Finishing
10	Joints
11	Foam coating material
12	Foam material

Furthermore, all data (VOC, Importance, Technical Response, matrixs correlation, competitor data, technical targets, priorities, technical correlations) are included as the basis for making a quality house (House of Quality) shown in figure 1.

IV. CONCLUSION

Based on the quality house and interpretation analysis, conclusions can be drawn based on data obtained through Voice of Customer can be known the level of importance prioritized by consumers, namely the attributes of comfortable occupancy with an average value of 8.433, strong and lightweight construction with a value of 8.422, strong and neat joints with a value of 8.355, smooth and neat surface finishing with a value of 8.255, Trendy model/design with a value of 7.933, not weathered by insects and fungi with a value of 7.922, durable surface coating (varnish) with a value of 7.588, and finally natural color with a value of 7.5. When viewed from the survey results, UD. XYZ is still less competitive with its competitors' products. For strong and lightweight construction UD. XYZ is still less competitive with UD. ABC and UD. FGH, as well as the model / design, natural / natural color, and surface layer (varnish) durable, while for a smooth and neat surface finish, and also comfortable attributes when occupied is still less competitive with UD. ABC, so from some of these attributes, it needs to be developed. So that the old design was then developed two new designs, namely the design (D01) and the design (D02). Of the three designs, the most in demand by consumers is the new chair design (D02) with an average value of 4.26, as seen from the average value obtained from the results of the snake plot questionnaire distribution. Figure 2 of the old design D0, and figure 3 of the new design D01 and figure 4 D02.

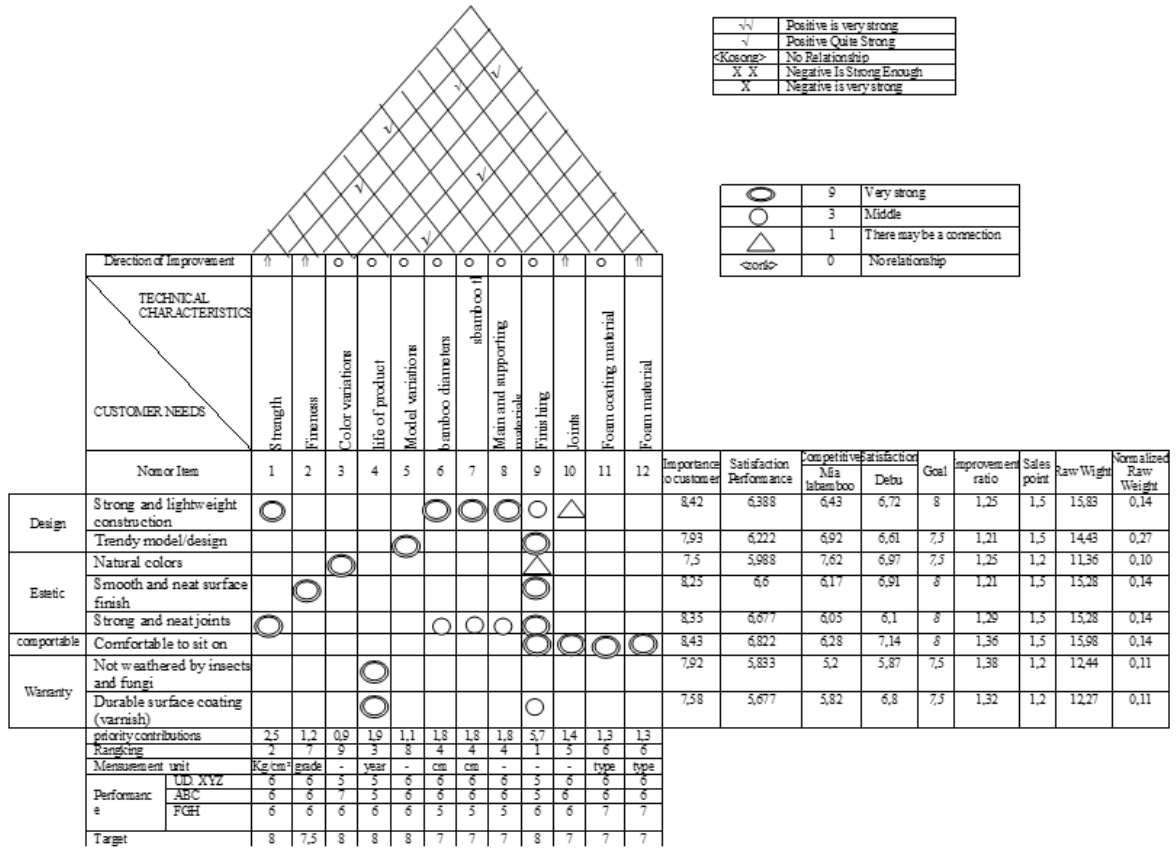


Figure 2. Old Bamboo Chair Design (D0)



Figure 3. New Bamboo Chair Design (D01)



Figure 3. New Bamboo Chair Design (D02)

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