

## APPLIED QUALITY FUNCTION DEPLOYMENT (QFD) FOR ELONGATED CHAIR DESIGN

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### ABSTRACT

In line with the times, the need for product development ideas has a high selling value. Economic value and product efficiency are highly considered in the design, one of which is the design of a stall or café chair. In general, the most used seats are permanent. In other words, it can't adjust when used for a few people or for a lot of people. Therefore it is necessary to design stalls and café chairs that can be stretched or shortened automatically. The purpose of designing this elongated chair is, it can be arranged so that it can be shortened, with this advantage we can save space and expand the space and of course it will be designed according to consumer needs. The elongated chair is made using the Quality Function Deployment (QFD) method. Some methods that must be done, namely the Voice of Customer collection phase, which is done by distributing questionnaires to 25 respondents. The next step is House of Quality based on the results of the questionnaire. After the HOQ is completed, then the analysis and implementation phase of the results obtained at HOQ will be applied to the product design.

**Keywords:** Lengthening Chairs, Quality Function Deployment, House Of Quality

### 1. INTRODUCTION

As we know, there are many different types of chairs in the market, better that garden chairs, sofa, study chairs, rocking chairs, porch chairs and so on. The variety of materials, designs and functions is tailored to the needs and activities of everyday people. With this variety, it encourages product designers to compete with each other to meet consumer needs. Companies can innovate to meet customer needs (Lee-Mortimer, 1995).

In line with the times, object chairs are an interesting research topic. Therefore we

feel the need to develop a product that is a chair. This development is inspired by stalls or cafes, often when the stalls or cafes are full of visitors, and there are some consumers who still want to enjoy the wifi facilities in the stalls or cafes, as a result other customers don't get seats or must be crowded. This made the business people confused, because all the tables and chairs were filled by consumers.

From these problems an idea emerged to develop a chair that could be elongated or short and could be used indoors or outdoors. The elongated chair is made using the *Quality Function Deployment* (QFD) method. *Quality Function Deployment* (QFD) is one method for customer-oriented product development (Paulo, 2007). QFD is a way to improve the quality of goods or services by understanding consumer needs and then connect them with technical characteristics to produce an item or service at each stage of making goods or services produced (Ginting, 2010).

The purpose of designing this elongated chair is to be able to accommodate twice as much capacity, because it has twice the length of an ordinary chair. In addition to the other advantages of the elongated and shortening seats, these seats can be arranged so that they can be shortened, with this advantage we can save space and expand the space and of course it will be designed according to the needs of consumers.

The development of seats with the QFD method is done by distributing questionnaires to consumers who will then be made *house of quality* (HOQ), and the last product will be designed according to the evaluation of QFD and HOQ results.

Based on the explanation above, it can be concluded that the purpose of developing this elongated chair so that it can accommodate more capacity, can save space, and expand the space by using the QFD method, and product

design will be carried out according to the results of QFD and HOQ evaluation.

## 2. METOD

The elongated chair is a chair that can be extended automatically. The way this elongated chair works uses a 12 Volt DC dynamo 15 ampere as a driver, with 12 volt battery power, and to turn on the dynamo uses 2 push buttons. The design of this elongated chair also uses the *Quality Function Deployment* (QFD) method to determine the design, so that it can be in accordance with the wishes of the consumer.

QFD was introduced and developed by Dr. Yoji Akao, Professor of Management Engineering from Tamagawa University from 1965 to 1967 with Katsuyo Ishihara from Matsushita Electric. Akao defines QFD as a method for defining quality design with consumer expectations, then translating into target design and quality critical points, so that it can be used in the development phase of production or service in an industry (Dale, Carol, Glen, et al, 1999).

The purpose of *Quality Function Deployment* is not only to meet as many customer expectations as possible, but also try

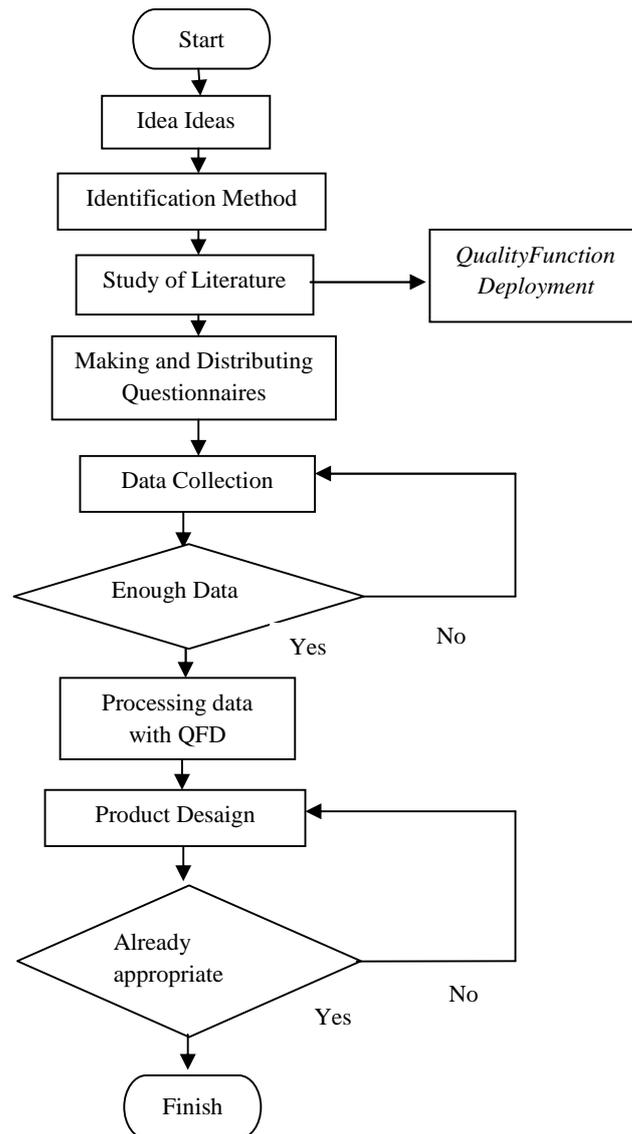
to surpass customer expectations as a way to be competent with competitors, so consumers are expected not to reject and not complain, but want it. While the benefits of QFD are to focus the design of products and services on consumer needs and satisfaction, analyze the performance of the company's products to meet customer satisfaction, and can reduce the number of design changes.

QFD implementation consists of three stages including :

1. Stage of gathering *Voice of Customer*.
2. Stage of quality house construction (*House of Quality*).
3. Analysis and implementation stages.

The steps in building a QFD are as follows :

1. Identifying Consumer needs, wants and needs are the initial stages of QFD.
2. Creating a planning matrix (*Planning Matrix*).
3. Preparation of technical interests. At this stage, the company identifies technical requirements that are in accordance with the wants and needs of consumers.
4. Determination of the relationship between consumer needs and technical interests.



### 3. RESULT

In this data collection, a questionnaire was created. The questionnaire itself is the main instrument for exploring and looking for

any attributes that respondents believe are important and expected from an office sofa. This study aims to determine the importance of each attribute.

Table 1 Interests of Attributes

Attribut	Responden																									Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
1. Quality	3	5	4	4	5	5	5	5	5	4	5	4	4	4	4	4	5	5	5	5	5	5	3	4	5	4.4
2. Material	3	5	4	4	5	5	5	5	5	4	5	4	4	4	4	4	5	5	5	5	5	5	2	4	4	3.76
3. Add Fitur	3	4	3	4	3	3	5	3	4	4	3	4	4	4	4	4	5	4	3	5	5	4	3	4	2	3.92
4. Easy Storage	4	4	3	4	3	4	3	3	4	4	3	4	4	4	4	4	5	4	4	5	5	4	3	4	5	3.84
5. Design	3	4	3	4	3	4	4	3	4	5	4	3	4	3	3	3	5	5	3	5	5	5	3	4	4	4.32
6. Strong	4	4	4	4	5	5	4	5	4	4	4	3	4	4	4	4	5	5	5	5	4	5	4	4	5	4.04
7. Life Cycle	3	4	4	4	4	5	5	5	4	4	4	3	4	3	3	3	5	5	4	5	4	4	4	4	4	4.48

This questionnaire was distributed to 25 collage students of the University of Surabaya Adi Buana PGRI, and the questionnaire results were obtained as follows :

From the seven Attributes in the table above, it can be seen if the product age has the

highest average value with the acquisition of 4.48.

In the preparation stage of the *House of Quality* a product calculation is carried out first. In the table below a comparison of the product of the Elongated Chair with the existing product, namely the Bench Palette.

Table 2. Product Objective Tables

Atribut	Bechbmaring					Evaluation Score	Target Value	IR	RII	WEHIT	% WEHIT
	1	2	3	4	5						
Quality				■		4	4	1	4,4	4,4	15,29
Material			■	■		4	4	1	3,76	3,76	13,09
Add Fitur				■	■	5	5	1	3,92	3,92	13,63
Easy Storage			■	■		5	5	1	3,84	3,84	13,35
Design				■	■	4	4	1	4,32	4,32	15,03
Strong			■	■		4	4	1	4,04	4,04	14,04
Life Cycle				■	■	5	5	1	4,48	4,48	15,57

In the table above, calculations are made for determining product objectives by looking for the values of IR, RII, Weight, and % weight.

$$IR = \frac{T}{E} \frac{V}{S}$$

IRR = Average Attribute Value

$$W_{ht} = I_i \times I_j$$

Weighting between attributes and technical responses can be known how strong or important the relationship between the two.

Table 3. Table of Relationship Interaction Matrix

Atribut	Customer Importance	% Weigh	Technical Responses										
			Terdapat bantalan penunjangnya	Kursi memiliki pijakan untuk kaki	Posisi dalam hal kenyamanan	Motor penggerak sebagai per gerak kursi	Penggerak dinamo dari listrik / stop kontak	Kursi memiliki daya beban yang kuat	Perawatan yang halus dan rapi	Ergonomi (kenyamanan dan keamanan)	Produk bisa bersaing di pasaran	Material yang memenuhi standar	Kursi tidak mudah rusak
Quality	4,4	15,29	□	□	□	□	□	□	□	□	□	□	□
Material	3,76	13,09	□	□	●	□	□	□	□	□	□	□	□
Add Fitur	3,92	13,63	□	□	●	□	□	□	□	□	□	□	□
Easy Storage	3,84	13,35	□	□	□	□	□	□	□	□	□	□	□
Design	4,32	15,03	□	□	□	□	□	□	□	□	□	□	□
Strong	4,04	14,04	□	□	□	□	□	□	□	□	□	□	□
Life Cycle	4,48	15,57	□	□	□	□	□	□	□	□	□	□	□



Based on the results of the priority technical response above, then the existence of a tool or driving motor is needed in designing elongated chair to facilitate users with the acquisition of a score of 240.48. In addition, the second important point with a score of 165,

53 is the procurement of material that meets standards. So in designing this elongated chair the material to be used is in the form of Holo iron, because this iron is strong and has an affordable price.



Figure 1. the picture of the chair is shortened



Figure 2. Picture of a Elongated chair

The design of the chair above has also been designed in accordance with ergonomics, because this is one of the three most important attributes that must exist in the design of elongated chairs with a score of 135.27.

#### 4. CONCLUSION

Based on the QFD methodology that refers to the statement from the customer, it has produced a product design of elongated chair. The design developed is expected to be able to meet the desires of consumers or users, especially in terms of the efficiency of the place and large capacity.

The design variable that is focused in designing this elongated chair is that there are additional features that can be used to extend the seat and the strength of the product, with score each of which are 240.48 and 165.53. Where the two design variables are translated into technical language or technical characteristics, namely, there is a motor

movers as a seat driver, and the material used has or meets the standard.

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