Trash Click Design Using House of Quality

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Abstract. The purpose of this research is to design bags as garbage bags used by mountain climbers who usually use plastic bags to store their trash. This garbage bag is called click trash. To ensure that trash clicks as produced trash bags will meet the needs of mountain climbers, product design is carried out using the concept of Quality Function Deployment in the form of a matrix shaped house called the House of Quality. This matrix changes the customer's voice directly to the specifications of the bag produced, from the questionnaire distribution 30 statements were obtained. Of these 30 statements, twelve technical characteristics were established in response to the needs of climbers which would influence the design of the specifications of the trash as a garbage bag. The click rubbish design made by referring to the technical characteristics produced so that the click rubbish specifications fit the needs of mountain climbers. The results of the design of this bag are expected to meet the needs of mountain climbers as a place to transport rubbish during climbing activities because of its beneficial that easy to use, more practical, can be used repeatedly, and to prevent leaving the trash in the mountain.

1. Introduction

House of quality is a tool used in the structure of the Quality Function Deployment (QFD) in the first stage in the form of a house shaped matrix. This stage is an effort to convert consumer voice directly to the technical characteristics of a product produced [1]. The concept of this tool is to design processes based on consumer needs as a priority in meeting the specifications of the products made [2,3].

Along with the large number of climbers, there are trash scattered both on the mountaintop and on the mountain slopes. Trash can be in the form of leftovers, used food and beverage packaging. Containers to accommodate garbage are needed by mountain climbers. Existing garbage bags have many disadvantages such as easy to tear, difficult to carry, not environmentally friendly and so forth [4]. Therefore, a special bag is needed that can carry waste when climbing or down the mountain. This bag can be installed in a mountain bag to make it more practical, can be used repeatedly and useful to eliminate bad habits of climbers who leave trash on the mountain. Bags that are needed like this are not yet on the market, the garbage bags that are available was made of plastic and are not very environmentally friendly. To design the bags needed by these climbers, house of quality is very suitable to be applied [5]. Characteristics of garbage bags that will be made based on the needs of mountain climbers (customer needs) in accordance with the concept of HoQ.

2. Method

The first step is to know the climber's customer needs by compiling the initial questionnaire openly without certain limitations. This questionnaire was distributed to 30 male / female respondents who had carried out mountain climbing activities. The results of the initial questionnaire are consumer
expectations of the product to be designed. Customer needs are classified into eight dimensions of product quality according to David Garvin [6].

The next step is to compile a final questionnaire that is closed which contains consumer statements and is divided into two parts, namely the value of the importance of the garbage bag that will be designed and the perceived value of the garbage bags on the market. The number of respondents for this questionnaire was 41, calculated using the Issac Michael formula with reference to the number of visitors in the camping category and from domestic origin from the website of the Directorate General of Forest Protection and Nature Conservation and the Directorate General of Natural Resources Conservation and Ecosystems.

To measure the extent to which the questionnaire can measure the measured data and show the extent to which the consistency of the answers to the questionnaire at different times, the following steps are carried out to test the validity and reliability test. The results of these two tests state that the questionnaire is valid and reliable. The next step is the preparation of house of quality with the stages of compiling customer needs, arranging the planning matrix, determining the technical response, determining the relationship matrix, determining the technical correlation, and compiling the technical matrix. The last step is designing the design of garbage bag products based on the technical requirements on HOQ [7]. This stage aims to visualize the design of the climber’s garbage bag product.

3. Results and Discussion
The results of testing the validity of each statement variable are declared valid. It can be seen from the value of each Pearson correlation calculation far exceeding the value of each Pearson correlation table. The results of reliability testing, the questionnaire was declared reliable, because the value of Cronbach alpha obtained far exceeds the required value and tends to approach the number one. The customer needs of climbers that have been grouped on the dimensions of product quality along with the value of interest (expectation) on the bag that they want to design and the perceived value of bag bags on the market can be seen in table 1.

The value felt by climbers on the use of trash bags is below their expected values and overall the distance between them is quite far [8,9]. Technical characteristics designed are based on the climber's voice. Using Silnylon (C01) material that is waterproof, lightweight, tear resistant and durable. Cylindrical garbage bag (C02) which makes storage capacity bigger. The garbage bag has a height of 55 cm (C03) adjusted to the height of the mountain bag, diameter of 26 cm (C04), width of the bag strap of 2.5 cm (C05) so that it can hold the bag load with dimensions of 55 cm and 26 cm in diameter containing garbage, 125 cm (C06) bag length for enough to wrap the rope on a mountain bag, 3.5 cm stopper size (C07), two bag straps with a position of 15 cm from above and 20 cm from the bottom (C08) to support, zipper length 81 cm (C09) with facing sideways or tilted so that water cannot enter through the cavity in the zipper, two small rectangular pockets (C010), adding a glow in the dark rubber bracelet (C011) as a guide for the direction other climbers who are behind, the basic colors are blue, purple, green, pink and gray (C012) on the basis of not being able to easily look dirty when exposed to sand or other along the hiking trail when hiking is carried out.

The connectedness matrix is carried out in all statements by aiming to find out how strong the technical characteristics are determined in meeting customer needs. Technical correlation is carried out on each of the technical characteristics that have been set, with the aim of knowing whether each technical characteristic has an influence on other technical characteristics [10]. The use of Silnylon turns out to answer the most needs of consumers for products designed. In addition, C01, C02, C03, C04, C05, C06, C07 and C08 quite answered the desires of climbers. While the technical characteristics of C09, C10, C11 and C12 can be said not to answer too much what the climbers want. House of Quality from the design of climber’s garbage bags which can be seen in Figure 1 and 2.
Figure 1. Recapitulation of results of questionnaires from climber customer needs

| Initial Number | Customer Needs                                                                 | Value of importance (expectation) for trash click | Value of perceived for trash click |
|----------------|--------------------------------------------------------------------------------|---------------------------------------------------|-----------------------------------|
| P01            | Garbage bags don't tear easily                                                | 4.24                                              | 2.24                              |
| P02            | Has water repellent ability                                                     | 4.29                                              | 2.83                              |
| P03            | Resistant to friction in all fields                                            | 4.39                                              | 2.15                              |
| P04            | Characteristics of fast drying ingredients                                     | 3.93                                              | 2.54                              |
| P05            | Material is elastic (not rigid)                                                | 4.12                                              | 3.05                              |
| P06            | Material of garbage bags does not absorb odors                                 | 4.12                                              | 2.15                              |
| P07            | Usage supports every need                                                       | 3.85                                              | 2.93                              |
| P08            | Garbage bags can be installed on a mountain bag (carrier)                       | 4.15                                              | 2.22                              |
| P09            | Use of buttons / zippers                                                        | 2.93                                              | 1.73                              |
| P10            | There is a small bag on the outside side                                       | 2.78                                              | 2.10                              |
| P11            | Easy to clean                                                                  | 4.00                                              | 2.27                              |
| P12            | There are certain components or parts that can glow in the dark                | 3.02                                              | 2.15                              |
| P13            | Easy to pack (packing)                                                         | 4.39                                              | 3.17                              |
| P14            | Does not require large storage space in the bag                                | 4.49                                              | 3.24                              |
| P15            | Not difficult when used up / down the mountain                                 | 4.59                                              | 2.41                              |
| P16            | Does not affect bag balance                                                    | 4.12                                              | 2.56                              |
| P17            | Easy to remove and installed                                                   | 4.07                                              | 2.56                              |
| P18            | Has a storage capacity that is adjusted to the size of the carrier             | 3.63                                              | 2.51                              |
| P19            | Laying of the stopper is adjusted to the part of the mount bag (                | 3.46                                              | 2.32                              |
| P20            | Can be installed in various brands of carriers                                 | 4.27                                              | 2.49                              |
| P21            | Can be used repeatedly                                                         | 4.32                                              | 2.02                              |
| P22            | Durable product life (durable)                                                 | 4.37                                              | 1.93                              |
| P23            | Easy to repair if there is damage                                              | 4.02                                              | 1.66                              |
| P24            | The components of the product are easy to find                                 | 3.98                                              | 2.24                              |
| P25            | Using color is not easy to look dirty and not many color variations             | 3.29                                              | 2.71                              |
| P26            | Use bright colors                                                              | 2.71                                              | 2.39                              |
| P27            | Has a plain design (without certain images or patterns)                         | 2.73                                              | 2.66                              |
| P28            | Having concern for the natural environment                                     | 4.46                                              | 2.29                              |
| P29            | Using recyclable materials                                                     | 4.37                                              | 2.05                              |
| P30            | Prices that match the product quality                                          | 4.51                                              | 3.00                              |
Figure 2. House of quality climbers trash click
4. Conclusion
The results of this study obtained 30 statements of the needs of climbers’ garbage bag products and 12 technical characteristics to fulfill those needs. In other words, it can be concluded that the trash click design using the House of Quality method can translate climbers’ needs to garbage bags instead of trash bags.

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