Application of quality function deployment for the development of sulam tumpar motif design

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Abstract Regional crafts from East Kalimantan Province is a special embroidery, that's call sulam tumpar. Sulam tumpar is a decoration made on cloth or other materials with sewing needles and thread. Craft originating from the Dayak tribe in the East Kalimantan Province has a variety of patterns with bright colors. The problem in this research is how to develop a new motif of sulam tumpar by not leaving the local wisdom characteristic in its design in order to raise the name of this East Kalimantan craft in national and international. The purpose of developing this sulam tumpar motif is to design and develop a new motif that can be applied to all handicraft products, including fashion products for men and women. The results of this research activity are contributing new ideas in the development of the sulam tumpar motif in accordance with customer desires using the Quality Function Deployment (QFD) method, which is a blend of modern and traditional concepts followed by unisex motif designs and universal designs.

1. Introduction
Regional crafts from East Kalimantan Province, one of which is a special embroidery, that's call sulam tumpar. Sulam tumpar is a decoration made on cloth or other materials with sewing needles and thread. Craft originating from the Dayak tribe in the East Kalimantan Province has a variety of patterns with bright colors. Not only in the form of cloth, but sulam tumpar is also widely applied to various products such as bags, clothes, to wall hangings. Generally, sulam tumpar is used for handicraft and clothing products, which tend to be used by women. This is inseparable from the motif and colors that tend to be feminine.

Figure 1. Sulam tumpar.

The current development demands the development of fashion not only for women but also for men. Fashion trends that bring local wisdom can be combined with the development of fashion for all genders.
Sulam tumpar motif that tends to be feminine provides limits for men to wear this embroidery. The embroidered motif that is applied in most fashion products is for women, such as women's clothing, bags, necklaces, and others.

The problem in this research is how to develop a new motif of sulam tumpar by not leaving the local wisdom characteristic in its design in order to raise the name of this East Kalimantan craft in national and international. The purpose of developing this sulam tumpar motif is to design and develop a new motif that can be applied to all handicraft products, including fashion products for men and women.

2. Literature Review

2.1. Embroidery As Craft and Fashion Products
Culture is a lifestyle that develops continuously and is passed down hereditary [1]. Sulam tumpar is typical embroidery handicrafts from the Dayak culture in East Kalimantan Province. In its development, embroidery is widely used as a craft and fashion product. In developing of sulam tumpar, there is a need for market identification through input from customers' needs [2].

Each region has a unique cultural and ethnic characteristic, as well as the kerawang embroidery is one of Gorontalo Province's mainstay products. Naturalist and geometric motifs from embroidery cannot stand alone, so the distillation motif becomes a decorative motif in order to add to the beauty of embroidery. The development of other embroidery motif is done by making new designs that are more creative and innovative as their characteristics without ignoring the techniques applied previously [3][4]. The embroidery can also be visualized for interior products [5]. The development of handicraft products is not only focused on one fashion but can be expressed as an identity of the city where the craft originated [6].

2.2. Quality Function Deployment (QFD)
To develop the motif of the embroidery, it needs input from the consumer or that calls the voice of costumers. One method that departs from the needs of consumers is Quality Function Deployment, commonly abbreviated as QFD. It controls the quality of a product based on the wants and needs of costumers. This method has four stages, where each stage produces one matrix. The four stages are product planning, design planning, process planning, and production planning. The identification of customer needs is very useful in the product development process to get closer to the target [7][8]. It is really directed to the client, not the product, where the efforts of all the departments involved allow a match between client requirements and the product offered [9].

QFD as a method for quality design with consumer expectations, then translates it into the target design and critical quality points, so that it can be used in the development products [10]. QFD, as a method for quality design with customer expectations, then translates it into the target design and critical quality points so that it can be used in the development of the motif. QFD itself not only fulfills as many customer expectations as possible but also tries to exceed customer expectations [11].

Identification of customer needs is very useful in the product development process to get closer to the target of how exactly the attributes or products desired by consumers [12]. It is a quality tool that helps translate Voice of the Customer (VoC) into new products that truly satisfy their needs [13].

It's important to understand and meet customer needs to increase customer satisfaction. House of Quality (HOQ) is used as an interface tool with QFD. HoQ includes six main sections are 1. Customer's requirements, 2. Quality elements, 3. Relationship matrix, 4. Correlation matrix, 5.Competition Analysis, and 6. Priority [14].
QFD, with the main use in product development, is expected to assist in determining the direction of the development of the design of the motif in accordance with consumer needs through questionnaire results. It is also useful in developing products with the customer's sound application for fashion products [15, 16]. In fact, it is expected to be able to improve quality management and is designing new products to be made to meet customer requirements [17, 18].

3. Method
The method used in developing the Sulam Tumpar motif is the application of the use of Quality Function Deployment (QFD), which begins with the identification of customer needs through questionnaires. Questionnaires were given to 100 respondents who came from the community, academics, artisan, and the government, and it will be used as a basis for the use of QFD as a basis for determining the final priority of what attributes should be developed from this new Sulam Tumpar motif.

4. Results and Discussion
In developing the motif of the sulam tumpar, a survey was conducted on 100 respondents consisting of the community, government, artisan, and academics in the East Kalimantan Province. The results of the survey will get input from consumers or often referred to as the voice of the customer (VoC). Some stages that will be carried out in the QFD method are:

4.1. Determine Voice of Customer (VoC)
At this stage, information gathering related to the needs and desires of costumers will be carried out for the development of the design of the sulam tumpar motif. Information gathering can be done through a survey through a questionnaire, interviews, and even direct observation of costumers. The data that will be obtained from costumers are the attributes of the sulam tumpar products needed by costumers.

4.2. Making a House of Quality (HoQ)
House of Quality (HoQ) is a form of table or picture of quality houses that will be compiled to meet the needs of the desired attributes of costumers and the technical needs of companies or designers and their work teams. The steps in preparing this quality house are:

4.2.1. Matrix attributes customer needs. From the results of a survey conducted in the process of developing the motif of a sulam tumpar obtained the following data:
- The motif is not crowded
The motif characterizes the east Kalimantan
- Variation in the size of the motif
- Form of renewable / latest motif
- Color is inconspicuous
- The combination of colors
- Motives give the impression of masculine
- The motif is used for fashion/craft products

Attributes of the desired needs of customers, along with the level of importance, can be seen in table 1.

| Attributes                                           | Customer Importance |
|------------------------------------------------------|---------------------|
| The motif is not crowded                             | 3.66                |
| The motif characterizes the East. Kalimantan          | 4.09                |
| Variation in the size of the motif                   | 3.88                |
| Form of renewable / latest motif                     | 4.05                |
| Color is inconspicuous                               | 4.06                |
| The combination of colors                            | 3.70                |
| Motives give the impression of masculine              | 3.29                |
| The motif is used for fashion / craft products        | 3.29                |

4.2.2. **Technical requirements.** It contains the identification of product characteristics that can be measured to meet the attributes of customer needs regarding the development of the sulam tumpar motif. The technical requirements are:
- Geometrically shaped design
- Design Motif Shaped organic
- Unisex Motif Design
- Proportion of shapes
- A combination of modern and traditional concepts
- Universal design
- color composition

4.2.3. **Relationship Matrix.** The matrix that illustrates in table 2 and table 3 are the relationship between technical requirements and customer needs of the sulam tumpar motif.
| Technical Requirement                                                                 | Costumers Need                                                                 |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Geometrically shaped design                                                          | The motif is not crowded.                                                      |
| Design Motif Shaped organic                                                          | The motif characterizes the East Kalimantan                                    |
| Unisex Motif Design                                                                  | Variation in the size of the motif                                             |
| Proportion of shapes                                                                 | Form of renewable / latest motif                                               |
|                                                                                      | Color is inconspicuous                                                         |
|                                                                                      | The combination of colors                                                     |
|                                                                                      | Motives give the impression of masculine                                       |
|                                                                                      | The motif is used for fashion/craft products                                   |
|                                                                                      | The motif is not crowded                                                        |
|                                                                                      | The motif characterizes the East Kalimantan                                    |

Relationship Symbol Information:

= 9  
= 3  
= 1  
(empty) = 0
Table 3. Calculation of relationship matrix.

| Attribute                                      | Target Value | Existing Value | Customer Importance | Row Weight | % Weight |
|------------------------------------------------|--------------|----------------|---------------------|------------|----------|
| The motif is not crowded                      | 5.00         | 4.00           | 3.66                | 6.56       | 13.15    |
| The motif characterizes the east Kalimantan   | 5.00         | 5.00           | 4.09                | 9.17       | 18.38    |
| Variation in the size of the motif            | 4.00         | 4.00           | 3.88                | 4.12       | 8.27     |
| Form of renewable / latest motif              | 4.00         | 4.00           | 4.05                | 5.93       | 11.88    |
| Color is inconspicuous                        | 4.00         | 4.00           | 4.06                | 3.94       | 7.90     |
| The combination of colors                     | 5.00         | 4.00           | 3.70                | 6.49       | 13.00    |
| Motives give the impression of masculine      | 5.00         | 3.00           | 3.29                | 6.84       | 13.71    |
| The motif is used for fashion/craft products  | 5.00         | 3.00           | 3.29                | 6.84       | 13.71    |

Figure 3. House of Quality (HoQ).
4.3. House of Quality (HoQ)

In fig 3 is an HoQ that is made based on the customer's needs and technical requirements from the HoQ can be seen in the relationship between the matrix and the results in the form of technical priority, benchmarking, and targets of what will be developed from the motif.

Based on the House of Quality (HoQ), the ranking of the development of the sulam tumpar motif focuses primarily on the blend of modern and traditional concepts followed by unisex motif designs and universal designs. From this, the development of the design sulam tumpar motif will be oriented to the three main things.

5. Conclusion
The results of this research are contributing new ideas in the development of the sulam tumpar motif in accordance with customer desires using the Quality Function Deployment (QFD) method, which is a blend of modern and traditional concepts followed by unisex motif designs and universal designs.

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