Product Development Analysis using Quality Function Deployment

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Abstract. The purpose of this study is to assist companies in getting information about product development as a result of improving product quality in accordance with customer needs and can increase customer satisfaction. Quality Function Deployment (QFD) is a method used to support this study. This method is able to translate customer needs to the quality of products and services. House of Quality (HoQ) as the main tool of QFD can describe customer needs, company response, the strength of the company's weak relationship with customers for products or services. For this result, the analysis of this method can provide information about product development and quality improvement in accordance with customer needs that will be able to increase company profits. This method prioritizes customer needs, translates needs into technical characteristics and provides quality products or services by focusing on each customer satisfaction. This method measures the importance of customer needs based on a questionnaire that has been given, builds a matrix of relationships between needs and services and determines the quality ratings required by customers. So, the HoQ analysis of this method provides visualization for companies to develop products according to customer needs and has an impact on increasing customer satisfaction and profits for the company.

1. Introduction

Product is something that is made to be sold, usually something that is produced by an industrial process [1]. Product development must occur because product life cycles are getting shorter, forcing companies to create new complexities in development projects [2]. The consumer is a very influential aspect of product development [3]. Marketing strategies and customer involvement also influence product development [4]. The speed of product development is a key component in order to produce balanced product development and in accordance with company capabilities [5].

An effective Product Development activity is able to develop a product that is in accordance with customer desires and market strategies. However, there are often problems in product development due to product incompatibility with consumer needs. Fuchs et al [6] state that consumers have a very active role in the creation of product innovation. Consumer dissatisfaction and disloyalty is the impact of product development that is not in accordance with consumer needs [7]. In this research, Chan et al [8] state dynamic decision support systems are needed to predict customer value for product development. Battistoni et al [9] state that AHP is a method can be used for product development needs. But this method only produces weights of needs without filtering the criteria of consumers. TOPSIS method
can be used to develop new products by considering the company's qualitative and quantitative strategies [10]. But the disadvantages of this method did not consider the needs and satisfaction of consumers. This study describes the various attributes of a product and service desired by customers into the functional components of the organization, QFD is believed to help companies improve customer satisfaction.

Therefore, this purpose of this study is to provide information on product development and quality improvement in accordance with consumer needs using Quality Function Deployment [11]. This method prioritizes customer needs, translates needs into technical characteristics and provides quality products or services by focusing on each customer satisfaction. HoQ analysis of this method provides visualization for companies to develop products according to customer needs and has an impact on increasing customer satisfaction and profits for the company.

2. Method

This study used a quantitative approach by conducting survey data on a sample of respondents directly and conducting a comparative study of the survey results [12]. The first step, formulating the problem with questionnaires, observation, and study of literature for the theory in this study. The second step is to collect and analyze the data. The data used in this study came from companies engaged in selling fresh fruit in packaging and had problems regarding product development.

After formulating the problem and data, Quality Function Deployment (QFD) method is used to analyse product development needs. This method is suitable for creating new products or for improving or developing existing products or services. This method describes the various attributes of a product or service that are desired by customers into the functional components of the organization.

There are four steps in this method, the first step is Product Planning. This matrix is an attempt to convert the consumer's voice directly to the requirements or technical specifications of the product produced. This consumer's voice comes from a questionnaire distributed directly to consumers. House of Quality (HoQ) or quality table is the main tool used to describe in full the things that include product development. The attributes described by this method are Attributes of Customers' Needs and Desires (What's), Technical Responses from the company side (How's), Strengths and weaknesses of relationships between each Attribute Needs and Desires of Customers with Technical Responses (Relationship Matrix) and Strengths of Relationships among the Technical Responses (Correlation Matrix). The second step is a product design that translates technical requirements to key part characteristics or systems. The next step is Process Planning that is to identify key process operations necessary to achieve key part characteristics. The last step from this method is Production Planning that is established process control plans, maintenance plans, training plans to control operations [13].

3. Results and Discussion

Based on the results of the questionnaire on 30 respondents, obtained the value of customer satisfaction with customer requirements. Customer requirements are a representation of the criteria needed by the customer. By using a simple statistical calculation, the value of customer importance can be calculated for each customer requirement. The value of customer importance is in Table 1.
Table 1. The value of Customer Importance

| Customer Requirement | Customer Importance |
|----------------------|----------------------|
| Good Raw Material Resistance | 4.1 |
| Freshness and maturity of raw material is good | 4.2 |
| Varied Flavour choices | 3.9 |
| The Quality of packaging material using Paper Cup is good | 4.4 |
| Packing material using Paper Cup is easy to use | 4.3 |
| Variety Packaging Size Options | 4.4 |
| Product Packaging design is very attractive | 4 |
| Product Packaging design is striking and crowded | 3.5 |
| Affordable product prices | 3.4 |

The next step is to create a house of quality based on customer satisfaction and the functional requirements of the company. The House of Quality from this study is in Figure 1.

![Figure 1. House of Quality](image-url)
Figure 1 shows the connectedness matrix between consumer needs and technical requirements. This matrix states the relationship of the technical requirements of the product developed with the "voice of the customer" that influences it. This relationship is indicated by certain symbols and numbers are in Table 2.

| Relationship   | Symbol | Value |
|----------------|--------|-------|
| Strong         | ●      | 9     |
| Moderate       | ○      | 3     |
| Weak           | ▽      | 1     |

The next step is to calculate the value of technical Importance Rating. The results of this calculation are used to determine the functional requirements for product development. This value is the sum of the relation values multiplied by the value of customer importance. From the results of HoQ that have been made, the company knows the functional requirements of product development that must be done. The order of functional requirements for product development needed by the company is shown in Table 3.

| Functional Requirements          | Technical Importance Rating |
|----------------------------------|-----------------------------|
| Creating Unique Packaging Design | 111                          |
| Improve the Quality of Raw Material | 74.7                        |
| Add Bubble Wrap                  | 55.7                        |
| Increase Packaging Size Type     | 39.6                        |
| Mixing Primary Raw Material      | 35.1                        |
| Add Flavour to the Main Raw Material | 35.1                      |
| Product Promotion                | 30.6                        |

Based on table 3, "creating unique packaging design" has the highest rating of 111 with a relative weight value of 29%. This shows that the most recommended product development recommendation is to develop packaging by making unique packaging and adapted to specific themes. The final step of this study is that the company plans the product according to the recommendations given.

Why companies need this model? It because the consumer is a very influential aspect of product development and companies need a customer's voice for product development [3]. And by knowing the functional requirements of product development needed by customers, the company has the right product marketing strategy and is able to increase profits [4]. So, with this method, the company can prioritize customer needs, translate needs into technical characteristics and provide quality products or services by focusing on customer satisfaction and impacting on increasing company profits.

4. Conclusion
The conclusion of this study is the Quality Function Deployment can be used to provide product development and HoQ analysis of this method provides visualization for companies to develop products according to customer needs and have an impact on increasing customer satisfaction and profits for the company. So based on company interviews, the company gets product development recommendations that match customer needs and market strategies.
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