Conference Paper

A Modular and Mobile Product Design Approach for Feed Processor

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Abstract

This study aims to produce a modular feed processor design. Feed processing, flexibility, and mobility are taking into account in the design. The modular and integrated product design provides advantages such as (1) easy way of making and modifying the product, (2) feed processing can be done anywhere (3) equipment has mobility capabilities. The Modular Quality Function Deployment (QFD) method is applied to identify modules associated with the customer needs of the product. A survey about customer expectation and satisfaction was conducted in order to evaluate the gap of both. The highest value of the gap between customer expectation and satisfaction of products indicates that the customer needs are the focus of the problems. The most important customer needs are considered in the modification and improvement of design. These are (1) easy to use, (2) clean, (3) durable, (4) wide, (5) mobility capability, (6) safe, (7) strong, and (8) easy access.

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1. Introduction

The development of technology is currently growing rapidly and precisely in creating innovative products in the future (Tursch, Goldmann, & Woll, 2015). Technology is a unique combination of knowledge, productive resources, input, and systematic services to produce the desired output (Reijntjes, Haverkort, & Waters-Bayer, 1999). The use of technology can help improve the efficiency and effectiveness of resource management. Quality function deployment (QFD) process is generally used as a customer-oriented quality management and product development methodology in the manufacturing industry (Baran & Yıldız, 2015).

For rural communities, livestock such as buffaloes, beef cattle, dairy cows, goats, sheep, ducks or domestic poultry has a strategic role because the animals can be used as life savings as well as labor sources such as buffaloes and beef cattle. Livestock can also be used as a producer of organic fertilizer which is very good for increasing

agricultural production. In addition, having many cattle will improve social status. Problems related to livestock raising are the provision of feed for livestock. Traditionally, farmers collect food in the morning and evening without doing storage activities. Feed processing is carried out separately between the feed source and processing location. This causes the feed condition to decrease in quality and requires a long processing time.

To overcome these problems, the role of technology used to make the feed processor. This study proposes a method of designing a modular feed processor based on QFD. The design takes into account the easy way of making and modifying the product, feed processing can be done anywhere, and equipment has mobility capabilities.

2. Literature Review

The division of the product into an independent component raises the modularity. This independence allows companies to create variations of products and standardize components. Product modularity is frequently stated as a goal of good design practice, yet has not been as carefully studied as some other current design practices such as design-for-assembly (Ulrich, 1994). Modularity is the focus of the company's attention along with improvement efforts to rationalize the product line and to provide increasing varieties at a lower cost. Modularity arises from the division of a product into independent components, allowing companies to standardized components and create product variety. Product modularity is defined using two characteristics; (1) Similarity between the physical and functional architecture of the design and (2) Minimization of the degree of interaction between physical components (Erixon, 1998).

Modular design is built on the basis of functional analysis of a product with the same function or with different functions but has different specifications and performance. (Liu, Ong, & Nee, 2014). This is achieved by dividing and designing a series of general function modules, select and combine these modules to meet the requirements of the customers. feed processor is divided into 2 modules: feed cutter and machine support.

3. Methods

This work is in the context of modular product design. In order to collect information about customer need dealing with feed processor design, a survey was conducted. The survey includes several stages: (1) define the modularity of the feed processor as the basis for establishing questions of the survey, (2) making and retrieving the

questionnaire data, (3) processing the data with the QFD methodology. The object of this research is the feed processor. The number of respondents is ten people. Research data was obtained from the survey to farmers in Turi, Sleman, Yogyakarta, Indonesia. The purpose of this survey is to collect information about customer expectation and satisfaction.

4. Results and Discussions

The division of the product into an independent component raises the modularity. This independence allows companies to create variations of products and standardize components. Product modularity is frequently stated as a goal of good design practice, yet has not been as carefully studied as some other current design practices such as design-for-assembly (Ulrich, 1994). Modularity is the focus of the company's attention along with improvement efforts to rationalize the product line and to provide increasing varieties at a lower cost. Modularity arises from the division of a product into independent components, allowing companies to standardized components and create product variety. Product modularity is defined using two characteristics; (1) Similarity between the physical and functional architecture of the design and (2) Minimization of the degree of interaction between physical components (Erixon, 1998).

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Quality Function Deployment (QFD) is a method used for the planning and development of structured products that enable the development team to clearly determine the needs and wants of consumers, and evaluate each desired product or service capacity systematically provided to meet the wants and needs Consumers (Cohen, 1995). In general, QFD as a planning tool that is used to meet the sounds of consumers in the form of desires (expectations) and consumer needs. QFD will be used to translate the voice of consumers from the form of specific needs into the direction then engineering actions are disseminated through product planning, part, process planning, production planning, and service (Rahman & Supomo, 2012). Customer's voice are obtained by surveying the customers (Liu et al., 2014). We measured the severity of customer's perception items/questions using the Likert scale (1 to 5). The customer voice of feed processor is presented in Table 1. These are used to identify the customer expectation

and satisfaction which then collected by survey. The result of the survey are shown in Table 2. The table has been sorted by the highest gap values. The largest gap is given by the question "feed processor easy to use" with a value of 0.8 while the smallest gap is "Feed cutter is in clean condition." From this survey result, we leverage five most important customer need to be considered in the modular design of the feed processor. These are (1) feed processor easy to use, (2) has mobility capability (3) easy to access, (4) safe to use, and (5) wide processing area.

TABLE 1: Customer requirements.

No	Customer requirements
1	Easy to use
2	Clean
3	Durable
4	Wide
5	Mobility capability
6	Safe
7	Strong
8	Easy to access

TABLE 2: Survey result of customer expectations and satisfaction.

No	Survey questions	Expect.	Satisfac.	Gap
1	Feed processor easy to use	4.5	3.7	0.8
2	Feed processor has mobility capability	3.9	3.27	0.62
3	Easy to access area of processing	4.32	3.72	0.6
4	Safe to use	4.27	3.68	0.59
5	Wide processing area	3.69	3.21	0.48
6	Strong to process various types of materials	2.83	3.24	0.41
7	Stable to use	3.62	3.21	0.41
8	Easy to clean	4.17	3.79	0.38
9	Multi function	4.2	3.83	0.37
10	Light to move	4.31	4.07	0.24

5. Conclusion

In this paper, modular QFD is applied to develop a feed processor and to know the design parameters that are important to the customer. A feed processor is divided into

2 modules: feed cutter and machine support. The five most important customer needs are considered into modification and improvement of the design. These parameters are These are feed processor easy to use, has mobility capability, easy to access, safe to use, and wide processing area.

Acknowledgments

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