

# Application of quality function deployment in characteristics identification of spring bed product

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**Abstract.** Every company wants to produce products are in accordance with the customers wish and they have competitiveness with the other companies. One of the factors that determine consumer wish is the attribute of the product technical characteristics. The attributes of the product technical characteristics are obtained by conducting market surveys and questionnaires distribution. The research was intended to determine the technical characteristics of spring bed 6 feet using the QFD (Quality Function Deployment) method. Research with the QFD method produces a matrix that connects the product technical characteristics and consumer wish for the product and the problems encountered during the production process. Spring bed 6 feet products have 7 technical characteristics, namely assembly time, material elasticity, design efficiency, number of components, assembly costs, component size and material strength. The QFD method produces 3 attributes of technical characteristics that have the most influence on consumer wishes, namely assembly time, number of components and assembly costs. The technical characteristics in spring bed products are used as the main focus in spring bed product design to be acceptable to consumers and as an evaluation object in a product design.

## 1. Introduction

Technological developments are rapidly increasing in the industrial world and competition in the business world and competition in the business world require companies to be able to design and develop products that suit consumers' wants by competition factors consideration such as cost, quality and speed of products delivery to the market. The rapid development of the spring bed industry in Indonesia has increasingly made the conditions of competition in gaining market share tighter. This is because the spring bed is a product which is the basic need of each individual. Comfortable products will provide satisfaction for consumers. Consumer satisfaction will provide value added for companies to compete with the other companies [1].

The existing spring bed companies are trying to gain public trust by presenting comfortable and quality products. Companies are required to produce quality products in accordance with standards and reach all levels of society. In addition, companies must also be able to provide satisfaction to consumers. Consumer satisfaction is the level of one feeling after performance and perceived comparison results in proportion to their expectations [2, 3]. Satisfaction can be obtained from the comfortable and quality of product service to consumers. The speed of products delivery to the market is also an important factor in customer satisfaction. Consumer satisfaction can be a benchmark of product quality and an object for company evaluation.

A private company in the Medan city which is engaged in the manufacturing business of spring beds production. The company will produce spring bed products. The products produced by this company will be designed is spring bed 6 feet. Spring bed 6 feet is the most popular company product in the spring bed industry. The company has not been able to determine the attributes of the technical characteristics of spring bed products that are in accordance with the consumers wish. The attributes of the product technical characteristics are needed and the company maintain the consumers and compete with the other companies in the same field. Every company has a variety of prominent strategies to maintain customer loyalty. The problem in this study is to determine the factors in identifying customer satisfaction. The research was made because the company wanted to produce spring bed 6 feet products by product design according to consumer needs. Product design is needed and the products produced will be the product based on consumers wish and need.

One method that can be used for the design and development of consumers-oriented products is to use Quality Function Deployment (QFD). The QFD method is a method of quality engineering by consumer voices identification, consumer wishes determination and involving all of them in the stage of a product or service development. QFD uses a questionnaire that contains consumer wishes and investigates customer satisfaction with products are associated with technical characteristics [4]. QFD is a methodology to translate customer requirements into the final product of service characteristic [5]. In another definition, QFD is a structured process, a visual language, and a set of inter-linked engineering and management charts which establishes customer value using the voice of the customer and transforms the value to design, production, and manufacturing process [6]. The Japan Society of Quality Control formed a research group to specifically study Quality Function Deployment (QFD) in 1978. QFD is used to translate customer requirements to engineering specifications. It is a link between customers - design engineers - competitors - manufacturing. It provides an insight into the whole design and manufacturing operation from concept to manufacture and it can dramatically improve the efficiency as production problems are resolved early in the design phase [7, 8]. QFD provides a number of benefits for organizations try to enhance their competitiveness by continuous improvement to their quality and productivity. Benefits of QFD include: customer focus, time efficiency, teamwork orientation, and documentation orientation [9]. Analysis of the problem using QFD will get a matrix that connects the product technical characteristics and consumer wishes for the product and the problems occurred during the production process. QFD has a tool namely House of Quality (HOQ) which is the most important stage because of the consumers need in the improvement designs based on consumer needs.

Many previous studies have been carried out in overcoming the problem of quality improvement using QFD. I Ketut Ray Suwana, Ida Ayu Mahatwa Tuningrat and I Ketut Satriawan (2015) conducted research by applying Quality Function Deployment (QFD) in one of the mineral water industries in Bali. QFD was used in order to gain voice customer and building house of quality to determine current product of CV. Tirta Tamanbali. Identification of attribute of customer interest, evaluation of customer satisfaction and customer interest are the purpose of this research. The result showed that attributes of customer interest are no moss, no taste, no smell, purity, hygienic manufacturing process, available in small and large shops, distribution channels reaching the whole Bali, resilience and strength of packaging, environmentally friendly, discounts for purchasing in large quantities, ergonomic packaging, available in various size, customer care, demineralization, oxygen, competitive price, and affordable to all segments of the market. Available in small and large stalls, distribution

channels, resilience and strength of packaging did not meet the customer satisfaction [10]. Another study was also conducted by Sivadas Aniyani (2016) who applied the QFD technique in the design of custom made furnaces. This study use QFD to improve development time, increase products quality, reduce cost and meet the requirements of the customers that have become the crucial issues in today's enterprises competition. Heat treatment is an important manufacturing process and furnace is the key element in heat treatment process [11]. However, the application of QFD in improving product quality is still rarely applied to spring bed companies, especially on spring beds 6 feet. Based on that, this study aims to improve the quality of spring bed 6 feet products based on the wishes and needs of consumers.

## **2. Methodology**

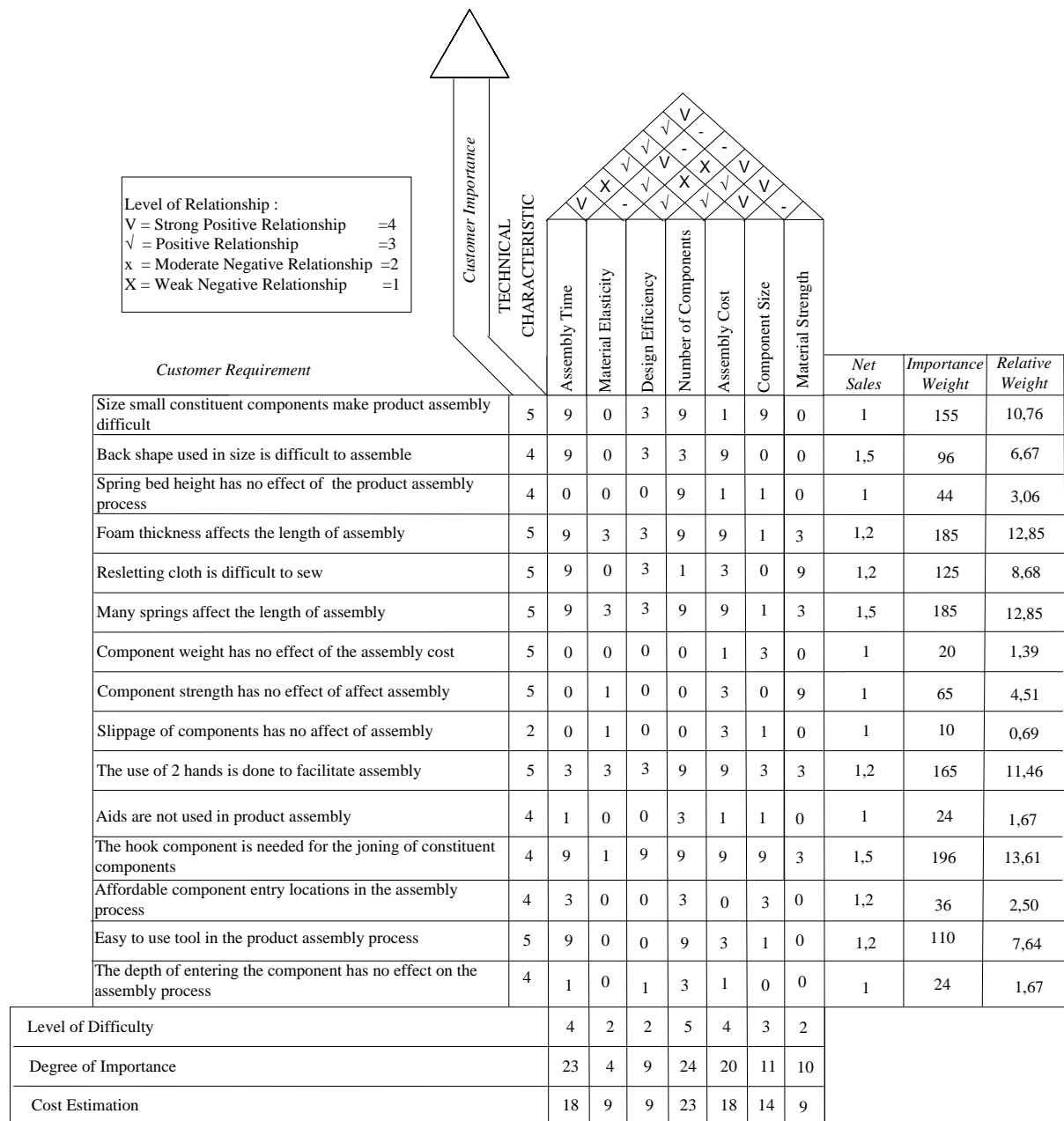
The study was conducted at one of the spring bed companies in the Medan city where the object under study was a spring bed 6 feet product. The research begins with direct observation of the spring bed company, especially on the spring bed 6 feet product to collect information related to the production process, materials and components used. Activities carried out at this stage are the production process observation, materials and components to produce the product. After observation, a survey and questionnaire will be conducted to determine the technical characteristics of the product in accordance with the consumers' wishes. Next is the topic and purpose determination of the study in accordance with the results of questionnaires distribution to consumers. After that, data was collected based on the results of questionnaires. Data collected based on the wishes and needs of consumers. After the data has been collected, the analysis is then carried out using Quality Function Deployment (QFD). QFD is a subset of management concepts and tools known as Total Quality Management (TQM) which evolved from the methods of statistical quality control. Among lots of TQM methods, QFD has been used to translate customer needs into technical design requirements by integrating marketing, engineering design, manufacturing, and other relevant functions of an organization [12]. Quality Function Deployment (QFD) was formed with the House of Quality (HOQ) Matrix to translate consumer needs into the companies' technical language. The stages in making house of quality are customer importance determination for the product, product characteristics determination, the relationship between product characteristics determination, the level of relationship between product characteristics and consumer wishes determination. Based on these stages, house of quality will be obtained which is will determine the highest level of importance.

## **3. Result and Discussion**

### ***3.1. Determination of Quality Function Deployment (QFD)***

Determination of the essence in QFD is a large matrix that will connect what customer wants (What) and how a product will be designed and applied to meet consumer needs. The main focus of QFD is to involve consumers in the product development process as soon as possible, which is needs and wishes. The application of the QFD methodology in the process of products design / services begins with the formation of a product / service planning matrix called house of quality.

Determination of consumer wishes attributes determined based on the results of the open questionnaire recapitulation obtained 7 attributes of customer wishes / needs. Determination of Technical Characteristics is carried out by conducting interviews with spring bed companies, especially the spring bed 6 feet. The House of Quality spring bed 6 feet product figure can be seen in Figure 1.



**Figure 1.** House of Quality in Spring Bed 6 Feet Product.

The results of house of quality shows that the most important attribute in producing spring bed 6 feet products are assembly time, number of components and assembly costs. The value of the level of difficulty, the degree of importance and the cost estimation sequentially for assembly time are 4, 23, 18. The value of the level of difficulty, the degree of importance and the cost estimation sequentially for the number of components are 5, 24, 23. The value of the level of difficulty, the degree of importance and the cost estimation sequentially for assembly costs are 4, 20, 18. The three attributes that most influences of production are selected based on the value accumulation of the level of difficulty, degree of importance and cost estimation.

#### 4. Conclusion

The core of QFD is a large matrix that will connect what customer wants (What) and how a service will be designed and applied to meet customer needs. The results of the QFD shows that of the 7 attributes obtained based on questionnaires, it is found that there are 3 attributes which are the top priority in spring bed 6 feet products production. The three attributes are assembly time, number of components and assembly costs. The value of the level of difficulty, the degree of importance and the cost estimation sequentially for the number of components are 5, 24.23. The value of the level of difficulty, the degree of importance and the cost estimation sequentially for assembly costs are 4, 20, 18. The three attributes that most influences of production are selected based on the value accumulation of the level of difficulty, degree of importance and cost estimation.

#### 5. References

- [1] Hartomo Soewardi, Ginanjar Sarwo Edhi 2017 *INSIST*, **2** (1) 58-62
- [2] P Kotler 2012 *Marketing Management* (Jakarta: PT. Indeks Kelompok Gramedia)
- [3] Jeremia Kolonia., Djurwati Soepomo 2019 *EMBA*, **7** (1) 831-840
- [4] Zaenab Armoun., Motjaba Javidnia., Zahra Nikkhah Farkhani., Somaye Nasiri 2012 *Management Science Letters*, 2525-2536
- [5] Ictenbas B.D., Eyrilmaz 2011 *International Journal of Social Sciences and Humanity Studies*, **3** (2) 73-82
- [6] Shahin, A 2008 *Quality Function Deployment: A Comprehensive Review in Total Quality Management Contemporary Perspective and Cases* (Iran: ICFAI University Press)
- [7] Ehsan S Jaiswal 2012 *International Journal of Mechanical Engineering and Civil Engineering*, **3** (6) 27-35
- [8] Siregar, I., Ginting, R., & Agnesia, F. (2017). Redesign Spring Bed Based on the Needs of Consumers. In *MATEC Web of Conferences* (Vol. 104, p. 03003). EDP Sciences.
- [9] Goetsch, David I. and Davis, Stanley B 2000 *Quality Management: Introduction to Total Quality Management for Production Processing and Services, Third Edition* (Prentice Hall: New Jersey)
- [10] I Ketut Ray Suwana, Ida Ayu Mahatma Tuningrat, I Ketut Satriawan 2015 *Jurnal Rekayasa dan Manajemen Agroindustri*, **3** (1) 63-72
- [11] Sivadas Aniyan 2016 *International Journal of Engineering Sciences & Research Technology*, **5** (7) 190-194
- [12] Akao, Yoji 1990 *An introduction to Quality Function Deployment* (Cambridge, MA: Productivity Press)