Designing Coffee Powder Products Through the Application of Quality Function Deployment Methods (Case Study at Small and Medium Enterprises Gusto Coffee)

D. Lestari [1], A. Abdurahman[2]

[1]Department of Agribusiness Management, Politeknik Negeri Jember, Jl. Mastrip PO Box 164 Jember 68121, Indonesia

[2]Department of Agribusiness Management, Politeknik Negeri Jember, Jl. Mastrip PO Box 164 Jember 68121, Indonesia

*E-mail: datiklestari21@gmail.com[1], alwan_abdurahman@polije.ac.id[2]

Abstract. Coffee is one of the world commodities that very famous because has a distinctive aroma and taste. One of the coffee processing industries is UKM Gusto Coffee which produces Robusta and Arabica powder coffee. As an SME business (UKM), Gusto Coffee must be able to know what attribute criteria are needed and desired by consumers for powder coffee products. One method that has proven to be effective and successful in fulfilling the needs and desires of consumers is using the Quality Function Deployment (QFD) method which begins with creating a product planning matrix (House of Quality), followed by creating a Product Planning matrix, Part Deployment, process planning and Production Planning. The purpose of this study was to identify the quality characteristics and level of preference of the Gusto Coffee UKM Powder coffee being tested, to analyze the development and improvement efforts of the Gusto Coffee UKM's powder coffee products using the Quality Function Deployment method. Important things for consumers that need to be considered in choosing powder coffee products include: (a) flavor, (b) aroma, (c) body. The order of priority for the technical response of powder coffee products from the highest includes: roasting, raw material selection (coffee beans), and grinding.

1. Introduction

Coffee is a drink that is very popular and favored by people around the world because of its taste. 70% of the taste quality of coffee is determined by the harvest and roasting process, while 30% of the quality of the coffee plant [1].

Roasting is the key to the roasted coffee production process because the character of the coffee flavor is only formed after the coffee beans are roasted. Roasting is an important step in developing the taste and aroma of the coffee beans. Different roast levels will result in different coffee flavors. During roasting, coffee beans undergo physical and chemical changes such as moisture content, color, volume, hardness, and volatile compounds. [2] A roasting problem that is often faced by coffee producers (UKM) is the difficulty in determining the right roasting time according to the desired roast level (degree). Therefore, the coffee roasting process must be controlled in such a way so that the taste of the coffee produced is in accordance with consumer desires. One of them is to use a drum-type roaster (electric) equipped with air flow (air control), cooling fan and temperature graphic display like that of CV. Gusto

Coffee. CV Gusto Coffee has been established since 2016 and is engaged in the production of roasted coffee, powder coffee and ready-to-consume coffee. CV Gusto Coffee as a coffee producer is faced with competition from other coffee producers so that innovation is needed, especially in powder coffee products so that they have a taste that suits the tastes and desires of consumers.

One method that has proven to be effective and successful in meeting the needs and desires of consumers is Quality Function Deployment (QFD). QFD is a systematic approach to meet customer requirements and is appropriately linked to engineering design, production planning and production processes [3]. Through the collection of consumer voices combined with the 4-phase QFD method (Product Planning, Part Deployment, Process Planning and Production Planning), it is hoped that the right method can be developed so that powder coffee can be created with a taste that matches the consumer's wants and needs.

The purpose of this study was to identify the quality characteristics and level of preference of the Gusto Coffee UKM Powder coffee being tested, to analyze the development and improvement efforts of the Gusto Coffee UKM's powder coffee products using the Quality Function Deployment method.

2. Method

This study involved two components of respondents, namely business owners and consumers. The selected consumer respondents are end customers. These final consumer respondents were selected in order to assess consumer perceptions and expectations of the attributes of ready-to-consume coffee products (roast results). Information about consumer expectations of roasted coffee product attributes was obtained from interviews and distributing pre-questionnaires and questionnaires.

2.1. Data Analysis Technique

1) Make a diagram to classify customer issues based on voice of customer (WHATs). In this phase, customer needs (WHATs) are the main input in HOQ (House of Quality) which shows a priority list of basic customer requests (requirements and needs) which are usually stated in vague and imprecise terms. Analyze competitors' products to find out their advantages and disadvantages. The scale used is the same as the customer need scale, namely 1-5. Where scale 5 is the highest achievement of competitors.

2) Calculating the improvement factor and overall weighting. Improvement factor can be calculated by subtracting the performance value of the company's existing products from the planned performance score, namely the number of points of improvement. This difference is multiplied by the increase in the improvement (eg 0.2) and this is added to 1 to give an increase factor. The overall weighting can be calculated by multiplying the weight of the level of importance by the ratio of improvements and points of sale.

3) Creating Technical Requirements (HOWs), namely design characteristics that serve to meet customer needs (WHATs). Technical requirements (HOWs) are design characteristics that serve to fulfill WHATs.

4) Assess the relationship between technical requirements and customer needs in each aspect. Relationships consist of weak, medium, and high. The three relationships have their respective symbols. This phase can be called the Relationship Matrix, where the relationship matrix is a product characteristic or decision affecting the satisfaction of each customer need. It consists of the relationship that exists between each WHATs and each HOWs.

5) Taking into account the factors that affect customer need, technical requirements, competitors and the correlation of these three factors. Absolute Weight and Ranking of HOWs contains the priority results of product characteristics to meet customer needs. This is the impact of each HOWs attribute in WHATs and is the final step before ranking the weights for decision making.

3. Result and Discussion

3.1. Whats Matrix

Coffee is a type of refreshing drink whose value is not only determined by its physical appearance, but also by its taste. The distinctive taste of coffee coupled with the physiological effects of caffeine in coffee which creates a fresh taste for those who consume it, causes coffee to be in great demand by Indonesians. Important things for consumers that need to be considered in choosing powder coffee products include: (1) aroma of brewed coffee, (2) flavor of brewing coffee, and (3) body of brewing coffee.

Aroma is something that is related to the impression a person feels when smelling the volatile components that are released from steeping coffee by using the sense of smell. Taste / Flavor is something that is related to the impression a person feels when tasting coffee with the help of their sense of taste. Thickness (body) is a physical characteristic of steeping coffee that creates a full impression during and after consuming coffee [4].

3.2. Technical Response Matrix (Hows)

The technical response matrix (hows) contains several attributes of technical characteristics (technical requirements) that need to be carried out by Small and Medium Enterprises. The technical response matrix is obtained by translating customer expectations or desires (whats) into the form of product development characteristics that the company needs to do so that it can meet consumer expectations and desires. The results of interviews and observations carried out obtained three technical response attributes, namely: Selection of coffee bean varieties (Robusta and Arabica), roasting, and grinding.

The improvement of the quality of the Gusto Coffee UKM's powder coffee products was realized by the company by making improvements to the powder coffee processing process which includes the process of selecting coffee bean varieties, roasting, and grinding. This is supported by the opinion [5] that the taste of coffee brewing is influenced by several factors such as: coffee beans, roasting, and grinding.

Following is an explanation of some of the technical response attributes (hows) which include:

3.2.1. Selection of Raw Materials (Coffee Beans)

Selection of coffee beans is the first technical matter that needs to be prioritized by Small and Medium Enterprises processing powder coffee, because coffee beans are the main basic material for making powder coffee. In this coffee bean selection, type or variety; quality level (quality); the origin of the coffee growing area; and the processing method of the coffee fruit into coffee beans greatly affects the taste of coffee drinks [5].

3.2.2. Roasting

Roasting is the most critical stage of the powder coffee processing process because it greatly affects the color, aroma, taste, acidity, and viscosity of powder coffee products. Roasting is the most critical stage in the processing of powder coffee. Coffee roasting really requires expertise, even though it is equipped with sophisticated technology. The right roasting process will be able to produce the flavor and color of the coffee powder according to consumer desires [2]. Arabica coffee has a strong aroma and light body so it requires a light roasting process, that is, with a lower temperature and medium maturity level [5]. On the other hand, Robusta coffee, which has an ordinary flavor and a strong body, requires a higher roasting temperature and a darker roasting rate. Lower roasting temperature is suitable for maintaining the acidity of Arabica coffee, but it cannot strengthen body robusta.

The measure of the ripeness of roasted coffee is the color of the beans, which ranges from dark brown to blackish brown, depending on consumer tastes. However, to maximize flavor, roasting should be stopped just before the coffee oil flows over the surface of the beans. The flavor formation of coffee takes place during roasting. Variables in roasting, such as the type and physico-organoleptic properties of coffee beans, the ratio between temperature and roasting time, roasting degree or style, the roasting

method greatly determines the character of the coffee flavor to be produced [5]. During roasting, carbohydrates are decomposed into organic acids and CO_2, followed by the breakdown and evaporation (volatilization) of these organic acids as compounds that form coffee aroma.

3.2.3. Grinding

Grinding aims to reduce the size of coffee particles. While the main objective is grinding / crushing. Grinding is to increase the specific extraction surface or increase the contact area between water and solids to facilitate the transfer of solutes and emulsions into hot water [6]. Grinding is the process of reducing the size of roasted coffee beans to make it easier to consume [7].

The results of grinding coffee beans are divided into three groups, namely: coarse (coarse powder), medium (medium powder), fine (fine powder), very fine (very fine powder). The choice of coarse and fine powder coffee is related to the way the coffee is brewed favored by the community. The grinding process releases CO_2 gas from the coffee. Most of the CO_2 gas is released during the process and after grinding. However, some CO_2 gas may still be retained, especially in powder coffee.

The particle size of powder coffee affects the extraction process in brewing coffee [6]. The smaller particle size allows better contact of the coffee and water particles. However, a coffee particle size that is too fine (<0.5 mm) can give coffee a more bitter taste.

The house quality image of the powder coffee product is shown in Figure 3.1. Based on Figure 3.1 on the correlation between the Hows and Whats matrices, it can be seen that coffee aroma is strongly influenced by the roasting process. Product flavor is strongly influenced by the choice of coffee beans and roasting, while the body product is strongly influenced by the selection of raw materials and grinding.
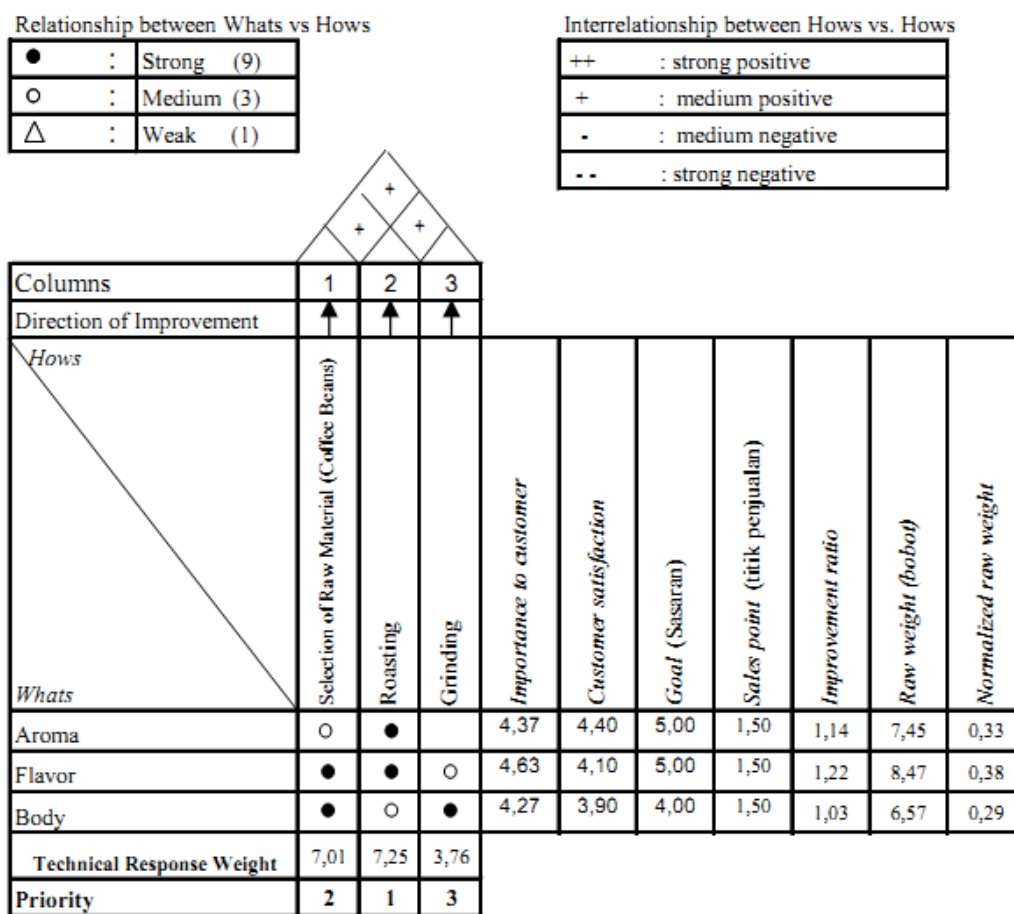

Figure 3.1. House of Quality of Powder Coffee Products

3.3. Importance to Customer Sub Matrix (Consumer Interest Level)

Importance to customer sub-matrix contains consumer assessment of each product quality attribute. The highest order of importance to customer attributes includes: flavor, aroma, and body.

The flavor of brewed coffee is an organoleptic element of coffee which is the first priority for consumers. Coffee with a delicious taste and in accordance with consumer tastes will provide satisfaction for consumers and then consumers will return to buy the same product. The taste of coffee that is preferred by consumers is that which has a strong coffee flavor.

The aroma of brewed coffee is a second priority for consumers after the taste of brewed coffee. The aroma of brewed coffee that is generally preferred by consumers is with a fruity aroma, floral aroma and chocolate aroma. The organoleptic elements of coffee taste and aroma are interrelated, coffee with a delicious aroma and taste will be able to provide satisfaction to consumers so that in the end consumers will want to go back to consuming the same product.

The third priority level of importance is the body of brewing coffee, which is an organoleptic element that is preferred by consumers. Coffee products that have a fairly high body are very popular with consumers and this is also related to the taste aspect. Coffee that has a low viscosity level generally has a bland taste because the coffee particles that make up the taste of coffee are only slightly dissolved in the brewed water.

3.4. Sub Matrix Customer Satisfaction Performance (Level of Customer Satisfaction)

Determination of the level of satisfaction is determined from the results of the consumer evaluation questionnaire. Customer satisfaction performance is the consumer's perception of the quality of powder coffee products obtained from the product hedonic test (30 panelists). The order of customer satisfaction performance attributes from the highest includes: aroma, flavor, and body.

3.5. Priority Sub Matrix

The priority sub-matrix is obtained by sorting the technical response weight values from the highest to the lowest value. Technical responses that have a weight above the average should be prioritized because they have a major contribution to product quality. The technical response weight value is obtained by multiplying the normalized raw weight with the numeric relationship matrix. The order of priority for the technical response of powder coffee products from the highest includes: roasting, raw material selection (coffee beans), and grinding.

The technical response attribute that has the largest contribution is roasting so it gets the first priority. The roasting process is a very important process in determining the final quality of powder coffee products. The roasting method/method must be determined precisely (temperature variations and roasting time) in order to produce roasted coffee color and taste (aroma and taste) according to consumer desires.

The second priority is the selection of raw materials (coffee beans). Coffee beans are the main raw material for making powder coffee. Types or varieties; quality level; the area where coffee is grown has a significant effect on the flavor of coffee drinks. High quality coffee beans, if processed into powder coffee, will be able to produce a product with high taste.

Grinding is the third priority. Coffee grinding can affect the flavor, body and aroma of coffee. Grinding powder coffee into particles with a very small size (<0.5 mm) will increase the bitterness and increase the consistency of the coffee brew. The color of the coffee brew will also get darker with the smaller the coffee particle size.

4. Conclusion

- Important things for consumers that need to be considered in choosing powder coffee products include: (a) flavor, (b) aroma, (c) body.
- The order of priority for the technical response of powder coffee products from the highest includes: roasting, selecting raw materials (coffee beans), and grinding.

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