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Product Design and Development

Application of House of Quality (HoQ) for Product Quality Improvement in Fruit Salad MSMEs in Batam City

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A B S T R A C T

Fruit Salad SMEs in Batam City face significant challenges in improving product quality and services to meet customer needs. This study aims to identify and analyze the needs of customers of Fruit Salad SMEs in Batam City and formulate quality improvement strategies using the House of Quality (HoQ) tool. Data were obtained through surveys and analyzed using Pearson correlation to ensure validity and reliability. The results show that all items have a significant correlation with the total score, with correlation values ranging from 0.697 to 0.860 and p-values < 0.05, indicating strong data validity and reliability. Specifically, the item "Price appropriate to quality" showed the highest correlation at 0.860, while "Ease of ordering" had the lowest at 0.697. The analysis confirmed that the formulated strategies based on customer needs can be relied upon to enhance the competitiveness of Fruit Salad SMEs in Batam City. The application of the HoQ tool provided a clear prioritization of quality attributes, allowing SMEs to focus on aspects such as "Good fruit quality" and "Maintained cleanliness and hygiene," which had the highest importance values of 10.369 and 10.000, respectively. By integrating statistical analysis and HoQ, this study offers a robust framework for the sustainable development and competitiveness of Fruit Salad SMEs in the dynamic market environment of Batam City.

1. INTRODUCTION

MSMEs (Micro, Small, and Medium Enterprises) have a very important role in the Indonesian economy, including in Batam City [1]. Along with technological developments and increasingly dynamic market needs, MSMEs are faced with the challenge of continuously innovating and improving the quality of their products and services. In an effort to face these challenges, this research focuses on Fruit Salad MSMEs in Batam City that try to understand and meet customer needs through the application of the House of Quality (HoQ) method.

Various previous studies have shown the importance of innovation and the use of technology in improving the quality of MSME products. For example, the Batam Home Chefs Website study shows that the use of websites can increase the recognition and sales of MSME products during the COVID-19 pandemic [2]. In Pringsewu Regency, MSMEs that innovate by switching from offline to online sales are able to survive the pandemic [3]. In addition, training and innovation development are proven to improve product quality and employee performance of MSMEs as shown by the Raja Padang Fruit Salad MSME [4].

This research is also in line with creative economic empowerment efforts through training and product processing that have proven effective in improving partners' skills and knowledge, such as in the training program in Nglarangan Hamlet [5]. In Kajoran Village, the development of local products such as papaya dodol has also shown great potential in improving the community's economy [6]. In addition, the use of social media as a digital marketing tool has been proven to strengthen brand awareness at MSME Salad Alvi [7]. The grouping of MSME advertising characteristics also helps in designing more effective marketing strategies [8], while consumer preferences for product flavor and price through e-commerce show the dominance of these factors in the decision to purchase fruit salad [9].

2. LITERATURE REVIEW

2.1. House of Quality (HoQ)

House of Quality (HoQ) is a tool used in the early stages of Quality Function Deployment (QFD) to transform customer requirements (what) into specific technical characteristics (how) [10]. HoQ consists of several components, including a list of customer requirements, technical characteristics, relationships between requirements and technical characteristics, and

competitive evaluation. The HoQ creation process starts with collecting customer requirements data through surveys or interviews, followed by analysis to identify relevant technical characteristics [11]. The HoQ matrix helps in prioritizing quality improvement efforts based on valid and reliable data, so that companies can focus on the aspects that are most important to customers.

2.2. Application of HoQ in MSMEs

The application of HoQ in MSMEs can provide great benefits in improving product and service quality. Previous research has shown that HoQ can assist MSMEs in formulating more structured and effective quality improvement strategies. For example, a study conducted by Muchsinati [2], showed that the implementation of HoQ in food MSMEs in Batam succeeded in improving product quality and customer satisfaction. In addition, Saputri [4] also found that training and application of the HoQ method can improve employee performance and product quality of MSMEs. Therefore, using HoQ as a quality management tool can be an effective strategy for MSMEs to face challenges and improve product quality in the market.

3. METHODOLOGY

This research uses a survey method to collect data from respondents regarding the quality of services and products offered by "Haura" Fruit Salad UMKM. The questionnaire used consists of ten items designed to measure various aspects of product and service quality, such as fruit quality, appropriate price, packaging, cleanliness, service, ease of ordering, recommendations, product availability, and promotions and discounts. Each item is rated using a Likert scale from 1 to 5, where 1 indicates very high dissatisfaction and 5 indicates very high satisfaction. The data collected was analyzed to measure validity and reliability using Pearson's correlation between each item and the total score.

To test validity, a Pearson correlation between each item and the total score was calculated. Validity was considered good if each item showed a significant correlation (p-value <0.05) with the total score [12]. A high correlation between the items and the total score indicates that each item significantly contributes to the overall construct being measured. In addition, reliability is measured through inter-item correlations. A consistent and moderately high inter-item correlation indicates that the items are measuring the same concept, and indicates that the measuring instrument has good internal consistency. Based on these results, it is anticipated that the Cronbach's alpha value will be high, indicating good reliability of the measuring instrument [13].

In addition to the correlation analysis, the Anderson-Darling normality test was also performed to evaluate the distribution of the data. This test helps to determine whether or not the data follows a normal distribution. Additional descriptive statistics such as mean, standard deviation, and confidence intervals were also calculated to provide further insight into the distribution of the data. This analysis shows that although the data is not completely normal, the measurement tools used have good validity and reliability, so they can be relied upon to construct the House of Quality (HoQ) matrix and accurately identify customer needs.

4. RESULTS AND DISCUSSION

Data analysis identified the customer needs of fruit salad MSMEs in Batam City and assessed the validity and reliability of the survey data. These results were used to develop the HoQ matrix. The discussion focuses on the interpretation of the results and their implications for MSME product quality.

4.1. Customer Needs Analysis

This analysis aims to identify the main aspects that are of concern to customers when choosing fruit salad products from MSMEs in Batam City. Data were collected through questionnaires covering different dimensions of product and service quality.

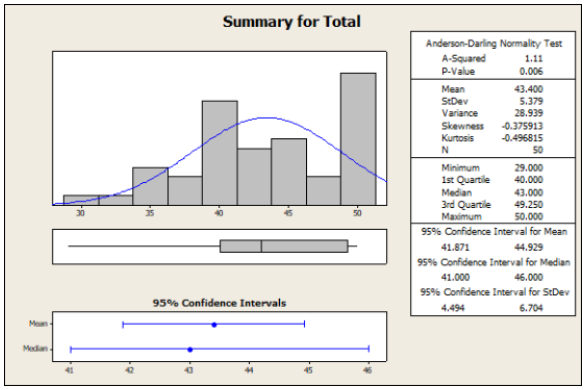


Figure 1. Descriptive statistics of Fruit Salad MSME user questionnaire dataset

In the questionnaire results (Figure 1), the Anderson-Darling normality test shows A-squared = 1.11 and p-value = 0.006. The mean of the data set is 43,400 with a standard deviation of 5,379. The data range from a minimum of 29 to a maximum of 50, with Q1 at 40,000, median at 44,000, and Q3 at 49,250. The skewness of -0.379 and the kurtosis of -0.496 indicate a slight left skew and a flatter than normal distribution. This analysis shows that although the data is not completely normal, the distribution is fairly consistent and reliable.

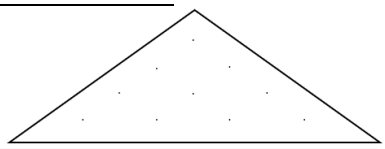
4.2. Validity and Reliability of Survey Data

Validity and reliability tests are carried out to ensure that the measuring instrument used is able to accurately and consistently measure the intended construction [14]. Validity was measured by looking at the correlation between each item in the questionnaire and the total score, with a significant correlation indicating that the item is relevant and appropriate for what it is intended to measure. In addition, reliability was measured by the internal consistency between the items, which was assessed by the correlation value between the items.

Table 1. Validity and reliability results of the questionnaire using correlation and p-value

Item Description	Correlation Value	p-value	Description
Good Fruit Quality	0.772	0.000	Valid & Reliabel
Price Matches Quality	0.860	0.000	Valid & Reliabel
Attractive and Practical Packaging	0.753	0.000	Valid & Reliabel
Satisfying Fruit Varieties	0.730	0.000	Valid & Reliabel
Cleanliness and Hygiene Maintained	0.762	0.000	Valid & Reliabel
Satisfactory Service	0.736	0.000	Valid & Reliabel
Ease of Ordering	0.697	0.000	Valid & Reliabel
Recommendations to Friends and Family	0.713	0.000	Valid & Reliabel
Product Availability	0.732	0.000	Valid & Reliabel
Attractive Promotions and Discounts	0.788	0.000	Valid & Reliabel

Table 1 shows the results of the validity and reliability tests of the questionnaire using Pearson correlations between each item and the total score, all of which showed statistical significance (p-value <0.05) with correlation values ranging from 0.697 to 0.860. The item “price commensurate with quality” had the highest correlation (0.860), indicating the importance of this factor in the overall quality assessment by customers. These results show that all items in the questionnaire significantly contribute to the overall construct being measured, and the high internal consistency among the items ensures that the questionnaire is reliable. Therefore, the data obtained can be relied upon to develop a quality improvement strategy using the HoQ tool.



Correlation:

+	.	-	
Positive	*No correlation*	*Negative*	
9	**3**	**1**	
Strong	*Moderate*	*Weak*	*None*
Competitive evaluation (1: *low*, 5: *high*)			

Percieved Performance	*Customer Importance Rating*	*Functional Requirements (How's)* → / *Customer Requirements - (What's)* ↓	Seleksi dan Pengadaan Buah Berkualitas	Penentuan dan Pengelolaan Harga	Kemasan yang Menarik dan Praktis	Desain dan Pengemasan Produk	Desain dan Pengemasan Produk	*Weighted Score*	*Satisfaction rating*	*Competitor rating 1*	*Competitor rating 2*	*Competitor rating 3*
4,5	10,369	Kualitas Buah yang Baik	9	3	3	9	9	342,166	148,500	1	1	3
4,28	9,862	Harga yang Sesuai dengan Kualitas	3	9	3	3	3	207,097	89,880	3	2	1
4,32	9,954	Kemasan yang Menarik dan Praktis	3	3	9	1	3	189,124	82,080	1	1	1
4,24	9,770	Varietas Buah yang Memuaskan	9	3	9	3	1	244,240	106,000	3	3	3
4,34	10,000	Kebersihan dan Kehigienisan Terjaga	9	9	9	9	3	390,000	169,260	1	1	4
4,38	10,092	Pelayanan yang Memuaskan	9	9	3	3	9	333,041	144,540	4	4	3
4,34	10,000	Kemudahan dalam Pemesanan	3	3	3	9	9	270,000	117,180	2	2	4
4,4	10,138	Rekomendasi kepada Teman dan Keluarg	9	3	9	9	9	395,392	171,600	2	1	4
4,16	9,585	Ketersediaan Produk	9	3	3	3	9	258,802	112,320	2	2	2
4,44	10,230	Promosi dan Diskon yang Menarik	3	9	9	3	3	276,221	119,880	3	4	3
		Technical importance score	659,724	541,106	600,553	523,134	581,567	2629,862				
		Importance %	25%	21%	23%	20%	22%	100%				
		Priorities rank	**1**	**4**	**2**	**5**	**3**					
		Current performance	6,6	5,4	6	5,2	5,8					

Figure 2. House of Quality (HoQ) Matrix for Fruit Salad UMKM "Haura"

4.3. House of Quality (HoQ) Matrix

Based on the validated data, the HoQ tool was used to identify customer needs in depth and formulate quality improvement priorities. This approach allows Haura Fruit Salad MSMEs to focus on the aspects that have the greatest impact on customer satisfaction, ensuring that any improvement efforts have a significant positive impact.

In Figure 2, the HoQ analysis showed that the highest priority customer needs were good fruit quality and hygiene and cleanliness, with importance values of 10.369 and 10.000, respectively. These two needs had a very strong relationship with functional requirements such as the selection and procurement of quality fruit and product design and packaging, which had a relationship value of 9. This indicated that companies should have focused their efforts on these aspects to meet customer expectations. Additionally, other aspects such as price commensurate with quality and satisfactory service also had fairly high importance values of 9.862 and 10.092, respectively, indicating that, besides product quality, price and service were also important to customers.

The competitive assessment showed that MSMEs still had some areas for improvement compared to the three main competitors. In terms of value for money, MSMEs had a customer satisfaction score of 89.880, which was lower than some competitors. This indicated the need to adjust pricing strategies or improve the perceived value of products in the eyes of customers. The highest technical importance scores were in the areas of quality fruit selection and procurement, and pricing and management, at 659.724 and 600.553, respectively. This suggested that MSMEs should have paid special attention to these two areas to improve overall performance. The current performance showed that while some areas were already quite good, such as good fruit quality with a score of 6.6, there was still room for improvement to achieve optimal customer satisfaction and better compete in the market.

5. CONCLUSION

This study successfully identified the customer needs of fruit salad MSMEs in Batam City using the House of Quality (HoQ) tool, with the highest priority being good fruit quality (importance value 10.369) and cleanliness and hygiene (importance value 10.000). The results showed that aspects such as product quality, reasonable pricing (importance score 9.862), and satisfactory service (importance score 10.092) strongly influenced customer satisfaction. The quality improvement strategies formulated based on these findings can be relied upon to enhance the quality of MSME products. For future research, it is recommended to expand the scope of the study by including more MSMEs and

additional variables such as product innovation and the use of digital technology in marketing, to gain more comprehensive insights.

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