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A Decision Support System for Evaluation Service Quality by Fuzzy SERVQUAL: A Case Study of a Modern Riteil

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ABSTRACT

This research was conducted in a retail store in the city of Semarang. The main focus was to measure the quality of service against consumer perceptions and expectations of the retail rate. This study analyses the factors influencing consumer perception and how to design services to match consumer expectations. The population in this study is consumers who shop. The method used in this study is the Fuzzy Servqual method. Based on the results of processing and analysis, it is known that the dimensions that have the highest gap value are the Assurance dimension (-1.5175), while the tangibles dimension (-1.37), reliability (-0.318), responsiveness (-0.176) and empathy (0.315). From the result of the gap value, the empathy dimension is very satisfying, and customers feel comfortable with employee service, friendliness, and assistance with product info at retail. The assurance dimension is a dimension that must be improved by improving the state of the room, temperature, and lighting and providing a safe area for retail protesters.

Keywords: Retail, Quality Service, Fuzzy, Servqual

INTRODUCTION

One of the businesses whose competition is getting more arduous is the retail business. The presence of the modern retail industry utilizes the shopping patterns of the community, especially the upper middle class, who do not want to squeeze into traditional markets that are usually crowded with visitors and not neatly arranged [1]. Although modern retail is highlighted as able to kill traditional markets because it has many advantages, its development can be said to be unstoppable [2].

In recent years, Modern Retail A and Modern Retail I have become the most increasing retail Retail A and Modern Retail I consistently increased the number of branches in Indonesia. Seeing

promising opportunities in retail businesses, several other names emerged who wanted to try their luck in the retail business world. One is a Sharia-based minimarket; Halal Mart was established in 2017 and already has over 200 outlets or branches throughout the city across Indonesia.

The problem is that Halal Mart Retail's income is still far below the turnover of Modern Retail A and Modern Retail I in Semarang. Retail Competitors that have been established have a sales turnover of IDR 15,000.00-IDR 20,000,000, while Halal Mart retail has an average turnover of IDR 9,000,000. Based on the initial survey results in interviews with Halal Mart consumers and competing mini markets, this turnover problem is caused by several things, namely product completeness, product prices, services by employees, and facilities in the place itself.

This study aims to analyze what factors influence the consumer perception of services at Halal Mart and design Halal Mart services that are to consumer expectations. Service is one of the most essential things to attract consumers to use the products or services offered [3]. Service is also the key to the success of service marketing activities in offline electronic retail businesses in Indonesia [1]. To stand out from the competition, a company must have insight into its customers and service or quality insights to meet their expectations [4] better.

Prioritizing consumer satisfaction is a potential aspect and a challenge for companies in market competition [5]. A company or store must meet essential requirements to advance in market competition by striving to create and retain consumers because company development becomes difficult without consumer loyalty and satisfaction [6]. One of the main strategies to achieve success in business goals is to provide quality service to consumers [7]. To achieve this goal, every company must understand consumer expectations and needs and offer prices that match their products to be well received by consumers [8]. Previous research focused on the effect of the dimension of retail service quality on consumer satisfaction [9]. However, this dimension is rarely discussed in the electronic retail business of physical stores in Indonesia. Although several studies discuss the effect of service quality on consumer satisfaction in the retail industry, the study does not explicitly address the physical store electronic retail business. In addition, existing research has not explored the dimensions of retail service quality that most influence consumer satisfaction in the electronic retail industry of physical stores in Indonesia [10]. Therefore, research focusing on the effect of retail service quality on consumer satisfaction in the electronic retail business of physical stores in Indonesia can be an essential contribution to the development of retail trade in Indonesia [8].

The application of Fuzzy Logic is one of the right ways to map an input space in an output space and have a continuous value [11][10]. Logic that uses the concept of vagueness with many truths expressed in absolute numbers in intervals [0,1] [12]. In Fuzzy Logic, decision-making is done with an inference system called the fuzzy inference system, which is a process of making conclusions based on Fuzzy Logic reasoning. The Fuzzy Inference System uses several methods: Mamdani, Tsukamoto, Sugeno, and fuzzy Serviqual [13]. The Fuzzy Service Quality Method works by comparing perceptions and expectations. This method is the most appropriate to solve the problem. Fuzzy service quality measures five gaps, but the point of pressure and attention is the gap between perception and expectation [14]. Fuzzy Serviqual uses a Likert scale with a value range between 1 and 5 to express the level of perception and expectations of customers because the range of values used by Fuzzy can connect someone's estimates with the data processed [15]. In research conducted by [16], the application of the fuzzy service quality method in analyzing the level of Travel Customer Satisfaction Using the Fuzzy Service Quality Method that the application of fuzzy service quality can determine the customer satisfaction index (IKP) of 83.76% of customers satisfied with the services provided. Meanwhile, in research conducted [6] in 2019, the application of the fuzzy Mamdani method in analyzing the level of customer satisfaction showed that the application of the Mamdani process can determine the customer satisfaction index (IKP) of 62.53% with good service quality and customers are pretty satisfied with the taste of food provided by Stores. Based on previous research, applying the fuzzy service quality method is more efficient, with a value of almost 100% [17], [18].

METHOD

Data Collection

a. Survey

This research is based on direct observations about services by officers at Halal Mart in Semarang City. This is intended to make it easier to create a list of questions to give to potential respondents [19] [20].

b. Questionnaire

The distribution of this Questionnaire is carried out to Halal Mart consumers. In this Questionnaire, several questions are developed using five servqual dimensions: reliability, responsiveness, assurance, empathy, and tangible [21]. The distribution of this first Questionnaire is carried out to see whether consumers can understand the statements in the Questionnaire, and it aims to see the data's validity level [22].

c. Interview

This interview process was conducted directly with respondents related to the quality of Halal Mart services and the level of satisfaction with the service [23].

Preparation of Questionnaires

A questionnaire was created based on secondary data obtained with 24 service quality attributes. Service quality variables, namely:

Table 1. Retail Service Quality Dimension Attribute Questionnaire

Dimension	Question
Tangibles	-Easy to reach and strategic location -Large parking lot -Ample air conditioning -Completeness of food products -Completeness of beverage products -Completeness of toilet tries products -Completeness of seasoning products -Completeness of health products -Product packaging conditions -Full product price tag
Reliability	-Quality of service -Product Quality -Ease of payment -Discount -Promotion Information
Responsiveness	-Speed of employee action in times of complaints from customers -Employee knowledge of the product -The level of patience of employees in receiving customer complaints
Assurance	-Ease of getting shopping services -Employee friendliness -Environmental security that makes visitors comfortable -Indoor comfort
	-Ease of customers asking employees for help -Good communication system between Employees and consumers

Empathy	-Responsibility from the management for the excellent service provided to customers

Data Processing

Fuzzification is performed on each criterion using the following overall effectiveness measure formula [24]–[26]:

Lower Limit (c)

$$= \frac{ci*n1+c1*n2+...+ci\ (k-l)*nk}{n1+n2+...+nk}$$

Middle Limit (a)

$$= \frac{ai*n1+a1*n2+...+ai\ (k-l)*nk}{n1+n2+...+nk}$$

Upper Limit (b)

$$= \frac{bi*n1+b1*n2+...+bi\ (k-l)*nk}{n1+n2+...+nk}$$

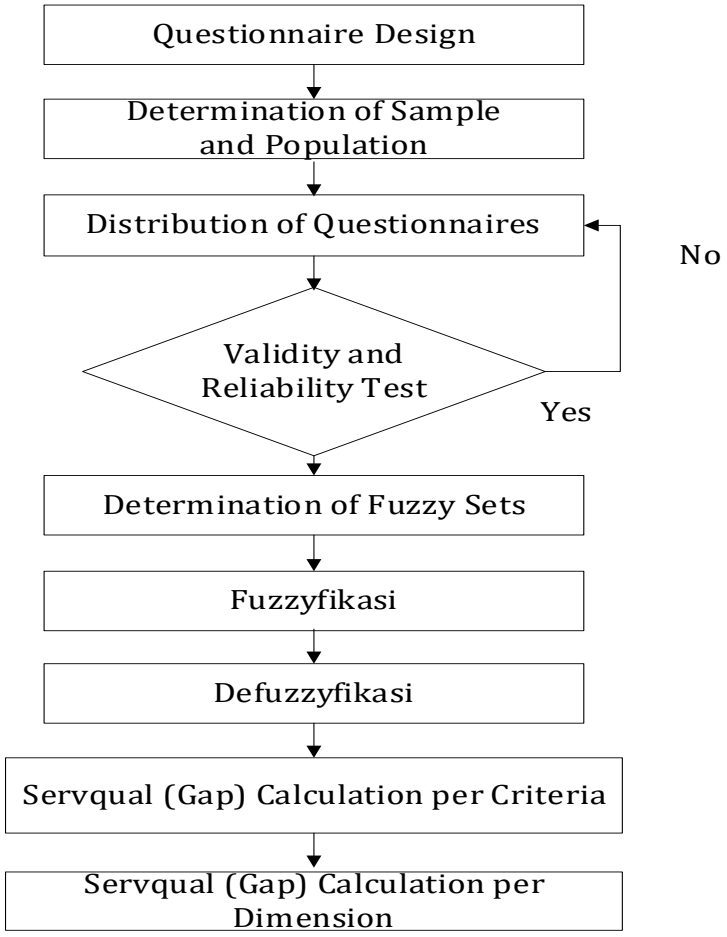

Figure 1. Thinking Framework

RESULTS

Test the Validity Of Questionnaire Dissemination Data

Test validity to determine the accuracy of the deployed Questionnaire. The validity test was carried out using a significant level of 5% and N = 10, obtaining an r table of 0.6319. Testing the validity of the data is done by comparing the calculated r-value with the table r-value. Data is said to be valid if the value of the r count is more significant than the r table, and vice versa. Information is invalid if the value of the r count is more minor than the r table. Product moment correlation with rough numbers is used to determine the instrument's validity in this study.

$$rxy = \frac{N.\ \sum XY - (\sum X)(\sum Y)}{\sqrt{\{N \sum X^2 - (\sum X)^2\}\{N\sum Y^2 - (\sum Y)^2\}}}$$

rxy = correlation coefficient
N = number of trial respondents
X = score of each item
Y = score of all test respondent items

The calculation results of the questionnaire pre-test data validity test can be seen in Table 2 as follows:

Table 2. Question Questionnaire Validity Test

Question To-	r (Perception)	r (Expectation)	Information
1.	0.718	0.766	Valid
2.	0.79	0.737	Valid
3.	0.671	0.704	Valid
4.	0.735	0.784	Valid
5.	0.683	0.692	Valid
6.	0.737	0.668	Valid
7.	0.761	0.703	Valid
8.	0.773	0.675	Valid
9.	0.648	0.635	Valid
10.	791	0.883	Valid
11.	0.739	0.648	Valid
12.	0.657	0.659	Valid
13.	0.832	0.846	Valid
14.	0.707	0.767	Valid
15.	0.785	0.766	Valid
16.	0.762	0.738	Valid
17.	0.68	0.653	Valid

This data reliability test was conducted using reliability analysis in SPSS 16.0 for Windows software. The data is reliable if the Chronbach alpha value is> 0.6. The results of the calculation of the reliability test of consumer perceptions and expectations can be seen in the table below

Table 3. Perceptual Reliability

Cronbach's Alpha	N of Items
.959	24

Table 4. Expectancy Reliability

Cronbach's Alpha	N of Items
.961	24

Based on the results of the calculation of the reliability test in Tables 3 and 4, it can be stated that the data is reliable because the value of Chronbach alpha > 0.6.

Fuzzy Servqual integration

a. Fuzzification

Fuzzyfication calculations are carried out to obtain the values of the lower Limit (c), middle Limit (a), and upper Limit (b), which are the values of the Triangular Fuzzy Number (TFN). Fuzzification calculations were carried out on the results of the perception questionnaire and expectation questionnaire per each statement.

b. Defuzzyfication of Triangular Fuzzy Number (TFN) values Perception and Expectation

Defuzzyfication is the calculation stage to obtain a single representative value from the results of fuzzyfication of perceptions and expectations. The defuzzification calculation is based on the results of the fuzzification value of each statement from the consumer perception and expectation questionnaire.

Table 5. Defuzzification of Triangular Fuzzy Number (TFN) values Perception and Expectation

Question To-	Perceived TFN Value			Defuzzification	Expectation TFN Value			Defuzzification
	C	A	B	Perception	C	A	B	Hope
1.	6.08	7.58	9.08	7.47	6.3	7.8	9.3	7.7
2.	7.68	9.18	10.68	9.09	6.2	7.7	9.2	7.6
3.	3.94	5.44	6.94	5.29	7.14	8.64	10.14	8.55
4.	3.78	5.28	6.78	5.13	7.36	8.86	10.36	8.77
5.	4.26	5.76	7.26	5.62	6.72	8.22	9.72	8.12
6.	4.34	5.84	7.34	5.7	5.26	6.71	8.21	6.61
7.	3.75	5.25	6.75	5.1	6.27	7.71	9.21	7.63
8.	4.22	5.72	7.22	5.58	5.42	6.92	8.42	6.8
9.	6.1	7.6	9.1	7.5	7.5	9	10.5	8.91
10.	6.91	8.28	9.78	8.24	6.32	7.82	9.32	7.72
11.	7.92	9.42	10.92	9.33	6.7	8.2	9.7	8.1
12.	7.22	8.72	10.22	8.63	7.24	8.74	10.24	8.65

13.	7.78	9.28	10.78	9.19	7.6	9.1	10.6	9.01
14.	4.08	5.58	7.08	5.44	6.3	7.8	9.3	7.7
15.	5.42	6.92	8.42	6.8	6.12	7.62	9.12	7.52
16.	7.34	8.84	10.34	8.75	7.7	9.2	10.7	9.11
17.	6.32	7.82	9.32	7.72	6.94	8.44	9.94	8.35
18.	6.78	8.28	9.78	8.18	6.32	7.82	9.32	7.72
19.	6.62	88.12	9.62	8.02	7.6	9.1	10.6	9.01
20.	8.14	9.63	11.13	9.55	7.24	8.74	10.24	8.65
21.	4.12	5.62	7.12	5.48	6.86	8.36	9.86	8.26
22.	3.14	4.64	6.14	4.47	6.38	7.88	9.38	7.78
23.	6.46	7.96	9.46	7.86	6.32	7.82	9.32	7.72
24.	8.14	9.64	11.14	9.56	7.71	9.13	10.63	9.07

Servqual Value (Gap) Calculation per Criterion

The Service Quality value (Gap) calculation per criteria is the difference between the results of the defuzzification of perception and expectations. This gap value shows the extent to which Halal Mart has provided services that align with consumer expectations. Based on this Gap value, it can be seen which criteria have met the level of consumer satisfaction and which are still below the level of consumer expectations.

Table 6. Servqual Value (Gap) Calculation per Criterion

No	Statement	Defuzzification		GAP	Rank
		Perception	Hope		
1.	Easy to reach and strategic location	7.47	7.7	-0.23	10
2.	Ample parking lot	9.09	7.6	1.49	1
3.	Ample air conditioning	5.29	8.55	-3.26	22
4.	Completeness of food products	5.13	8.77	-3.64	24
5.	Completeness of beverage products	5.62	8.12	-2.5	19
6.	Completeness of toilet tries products	5.7	6.61	-0.91	14
7.	Completeness of seasoning products	5.1	7.63	-2.53	20
8.	Completeness of health products	5.58	6.8	-1.22	16
9.	Product packaging conditions	7.5	8.91	-1.41	17
10.	Full product price tag	8.24	7.72	0.52	4
11.	Quality of service	9.33	8.1	1.23	2
12.	Product Quality	8.63	8.65	-0.02	9
13.	Ease of payment	9.19	9.01	0.18	7
14.	Discount	5.44	7.7	-2.26	18
15.	Promotion Information	6.8	7.52	-0.72	13
16.	Speed of action of employees at the time of complaints from customers	8.75	9.11	-0.36	11
17.	Employee knowledge of the product	7.72	8.35	-0.63	12
18.	The level of patience of employees in receiving customer complaints	8.18	7.72	0.46	6
19.	Ease of getting shopping services	8.02	9.01	-0.99	15
20.	Employee friendliness	9.55	8.65	0.9	3

21.	Environmental safety	5.48	8.26	-2.78	21
22.	Indoor comfort	4.47	7.78	-3.31	23
23.	Ease of customers asking employees for help	7.86	7.72	0.14	8
24.	Good communication between employees and consumers	9.56	9.07	0.49	5

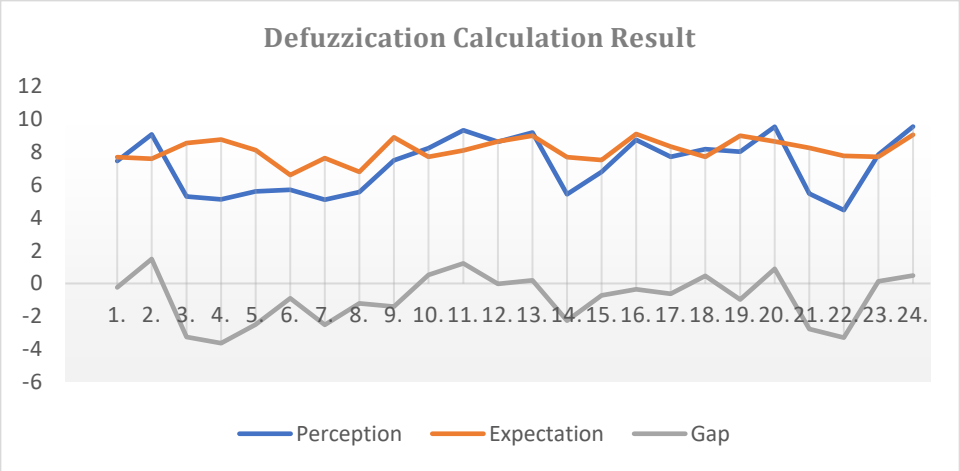

Figure 2. Gap Proportion Calculation

Figure 2 shows that a negative value gap means that expectations are more significant than the perception of Halal mart consumers (unsatisfactory category); a zero value gap means consumers are satisfied because the perception matches expectations. A positive value gap means that halal mart consumers are delighted. Negative gaps are found in question attributes 1, 3,4,5,6,7,8,9,12,14,15,16,17,19,21,22

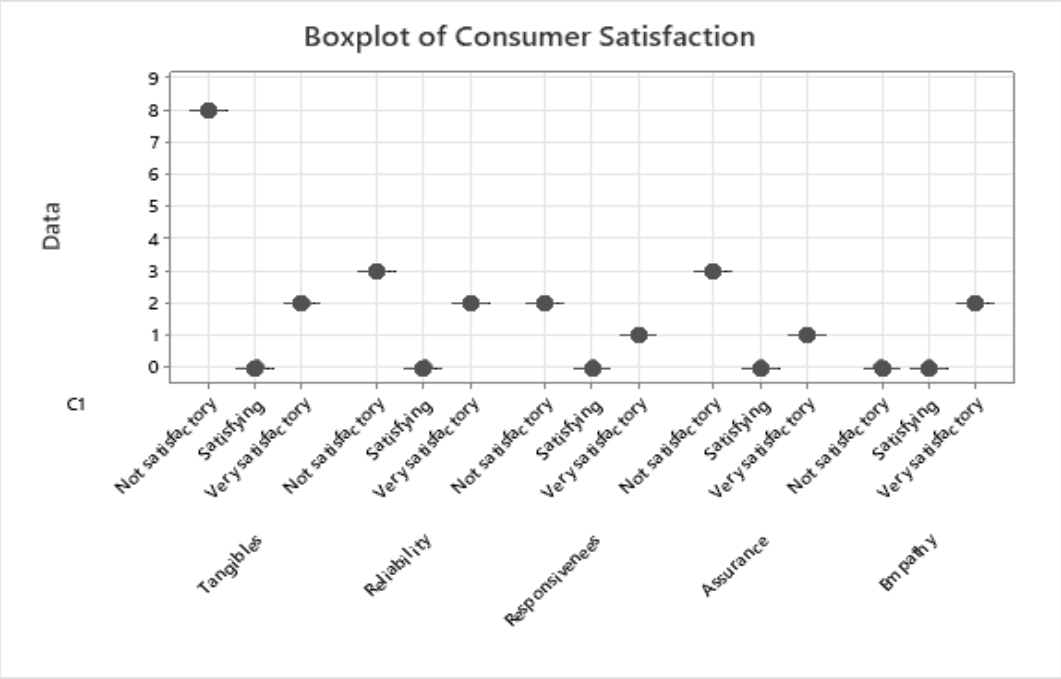

Figure 3. Box plot of Halal Mart Consumer Satisfaction Category

Overall Servqual (Gap) Value

Results of each dimension and criterion's overall servqual value recapitulation (GAP).

Table 7. Dimension And Criterion's Overall Servqual Value

Dimension	Perception	Hope	GAP	Ranking
Assurance	6,88	8,425	-1,545	5
Tangibles	6,472	7,841	-1,369	4
Reliability	7,878	8,196	-0,318	3
Responsiveness	8,2167	8,393	-0,1767	2
Empathy	8,71	8,395	0,315	1

The results of the calculation of the Gap per dimension in Table 7 show that empathy is the dimension that ranks first; in other words, this dimension is the most fulfilling compared to different dimensions. The responsiveness dimension ranks second, followed by the reliability, tangibles, and assurance dimensions. The assurance dimension occupies the fifth or last rank, which is very far from the expectations of halal mart consumers.

DISCUSSION

Whether or not the quality is good can be seen from the difference (GAP) between consumer perceptions and expectations. A negative GAP value indicates that the quality of a criterion from the minimarket needs to be improved [27]. The GAP value should be 0 (zero), showing that consumer perception of the quality of a standard is in line with expectations. If the GAP value (difference) is positive, it can be stated that the quality of the criteria has exceeded consumer expectations and must be maintained [28]. Fuzzy Service Quality is an approach that allows for a more nuanced measurement of customer satisfaction levels, considering the uncertainty and subjectivity associated with customer perception of the service. His research involved a customer survey at a café, which discussed aspects of service, such as speed of service, staff friendliness, product quality, and comfort of place [29]. The values of service quality in all dimensions, namely tangible, reliability, responsiveness, empathy, and assurance. If the indicator of obtaining a Gap 5 value is positive, it is very satisfactory. This positive value is found in the tangible dimensions (waiting room facilities) and responsiveness (speed of officers in serving participants). Then, a gap of 0.0 (Satisfactory) means no gap between perception and expectation; there is a reliability dimension [25]. The results of this study show that customer experience and service quality have a significant effect on predicting customer satisfaction, customer experience has a significant impact on predicting customer loyalty, service quality has no significant effect on predicting customer loyalty, customer satisfaction has a significant impact in predicting customer loyalty, and customer satisfaction mediates the prediction of customer experience and service quality on customer loyalty [30].

The results of processing consumer expectation defuzzyfication data show that the highest consumer expectation defuzzyfication value is the statement "good communication between employees and consumers," with a value of 9.88, and the lowest defuzzyfication value is the statement "Completeness of toilet tries products" with a value of 7.46. The calculation of the servqual value (GAP) per dimension shows that the dimension that meets the first rank is the empathy dimension with a servqual value (GAP) of 0.325, followed by the responsiveness dimension with a GAP of -0.173, the reliability dimension with a GAP of -0.308, the tangibles dimension with a GAP of -1.345 and finally the assurance dimension with a GAP of -1.5175. Based on the results of this ranking, the assurance and tangibles dimensions are essential and prioritized for improvement [31]. The same results in the study [32] the results of his research resulted in the Empathy dimension in the first place with a gap value of 0.633, the Assurance dimension in the second place with a gap value of 0.510, the Responsiveness dimension in the third place with a gap value of -0.343, the Tangible dimension in the fourth place with a gap value of -0.606 and the Reability dimension in the fifth position with a gap value of -

0.684. Services that achieve the level of satisfaction expected by customers are in the Empathy dimension and the Assurance dimension.

CONCLUSION

The dimension that meets the first rank is the empathy dimension with a servqual value (GAP) of 0.325, followed by the responsiveness dimension with a GAP of -0.173, the reliability dimension with a GAP of -0.308, the tangibles dimension with a GAP of -1.345 and finally the assurance dimension with a GAP of -1.5175. Based on the results of this ranking, the assurance dimension and the tangibles dimension are essential dimensions and are prioritized for improvement and improvement. The result of processing GAP data per criterion is that the statement with the highest GAP value is "Food product completeness," and the information with the lowest GAP value is "large parking lot.

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