KOMPUTASI: JURNAL ILMIAH ILMU KOMPUTER DAN MATEMATIKA
*Vol. 19 (2) (2022), 156 –166 p-ISSN: 1693-7554, e-ISSN:2654-3990*

# Analysis of Satisfaction Level with Hajj Registration Services Using Fuzzy Service Quality and Importance Performance Analysis

**Aditya Rivaldi**[1], **Herfina**[2], **Mulyati**[3*]

[1,2,3]Department of Computer Science, Faculty of Mathematics and Natural Science, Pakuan University, Bogor, West Java, 16143, Indonesia

**Abstract**

Service is an activity that is interactive between communities that aims to provide satisfaction and comfort. To achieve this goal, it is necessary to improve the quality and quality of services as well as in the Hajj registration service. The purpose of this study was to analyze the level of satisfaction with Hajj Registration Services using the Fuzzy Service Quality (Servqual) and Importance Performance Analysis (IPA) methods. The data collection technique in this study used 100 questionnaires. The statement items used refer to the dimensions of service quality, namely reliability, responsiveness, assurance, empathy and physical evidence and the methods used to analyze are service quality (servqual) and Importance Performance Analysis (IPA). The servqual method will measure the service quality of each dimension so that the gap value is obtained which is the difference between expectations and reality received by the registrant. The servqual method is then integrated with Importance Performance Analysis to classify certain service quality attributes. The results showed that the Hajj registrants were not satisfied with the quality of services provided by the Ministry of Religion in Kabupaten Bogor by showing a negative servqual score. In light of the aftereffects of the IPA, there are 9 attributes that are in quadrant B and quadrant C, 3 attributes that are in quadrant D and none of them are in quadrant A. Therefore, improving service quality needs to be carried out by the Ministry of Religion in Kab. Bogor.

***Keywords***: *Fluid simulation; hydrodynamics; ODE; SPH; surfing problem*

## 1. Introduction

Service is an activity that is interactive between communities that aims to provide satisfaction and comfort. Services need to be supported by service quality, adequate facilities, and ethical manners. One of the services that need to be considered is public services, especially in government agencies such as the ministry of religion in Bogor district. The agency is a government institution, one of which is engaged in the management of prospective pilgrims for Hajj and Umrah. Currently, the number of registrations for prospective pilgrims in these institutions is increasing day by day, so the waiting time for the queue reaches 18 years. This resulted in officers getting busier to serve the registrants, especially in providing information about the hajj. In order for the services provided

[*]**Corresponding author**. *E-mail address: mulyati@unpak.ac.id*
Received: 04 June 2022, Accepted: 19 July 2022, and available online 30 July 2022
DOI: https://doi.org/ 10.33751/komputasi.v19i2.5360

to run effectively and efficiently in accordance with established policies, a system is needed that can assist and identify satisfaction with the services provided. The method used in satisfaction analysis is the method of fuzzy service quality (servqual) and importance Performance Analysis (IPA).

In identifying customer perceptions and expectations using linguistic variables such as very satisfied, satisfied, fair satisfactory, dissatisfied and very dissatisfied. These linguistic variables are vague or indeterminate [1], therefore fuzzy theory is needed to convert the values of linguistic variables into numerical variables. Fuzzy logic provides a simple way to draw definite conclusions from information that is ambiguous, or vague in nature [2].

The servqual method is used to measure and manage service quality [3]. The servqual method is then integrated with Importance Performance Analysis in order to classify certain service quality attributes so that appropriate actions can be taken for each of these attributes. Several previous studies that have used the fuzzy Service Quality and IPA methods are measuring service quality at brokerage offices in Iran [4], measuring service quality by determining the gap between consumer expectations and perceptions, determining the level of significance between consumer expectations and perceptions, and determining the level of service quality[5], evaluates the quality of service in the hotel industry [6], conducts an analysis of Travel Customer Satisfaction [7]. Measuring service in the food industry [8], Service quality of the Tomohon Population Service [9], To analize education Services [10], satisfaction of patients who use BPJS Health services [11] and Implementation of Fuzzy - Service Quality Against Level Student Service Satisfaction [12]. Based on some of these studies, it can be seen that using Fuzzy service Quality and IPA methods can measure the quality of satisfaction with customer service. So, in this study, we try to use this method in determining the quality of Hajj registration services at the Bogor Ministry of Religion office.

## 2. Methods

This satisfaction level analysis was built using the System Development Life Cycle (SDLC) approach. The system development life cycle (SDLC) is a series of activities carried out in this study. Analysis of Hajj Registrant Satisfaction Levels is shown in Figure 1

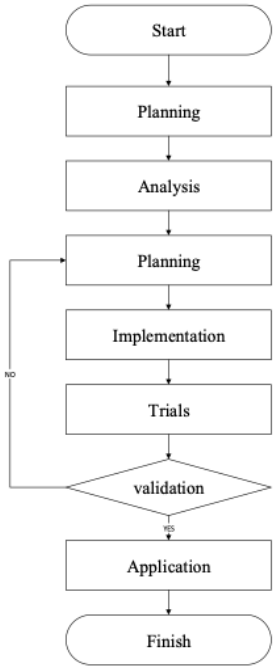


**Figure 1.** System Development Life Cycle Flow Chart

The steps taken during the study are broken down as follows:

1. **Planning**
   At this stage, in-depth planning is carried out before making a service satisfaction analysis system at the Ministry of Religion. Planning in this case includes finding the topics to be analyzed, the population and samples in the research and the methods that will be used in the system as well as adjustments to the topics discussed.

2. **Analysis**
   The initial step is to break down the assistance fulfillment issues contained in the Ministry of Religion and in view of the examination of the issues experienced, critical thinking arrangements and the servqual and IPA techniques are intended to be utilized in tackling these issues.

3. **Design**
   At this stage, the first step is to design the system design, the methods used, including the system flow, database design and web design. The design and flow of the system are arranged so that the system can work properly and correctly so that it is comfortable to use by system users.

4. **Implementation Phase**
   System implementation is carried out after the system design stage is completed. At this stage the implementation of the Servqual method and Importance Performance Analysis using the PHP (Hypertext Preprocessor) programming language, MySQL as database storage, and sublime text as the software used as an editor in the program implementation.

5. **Evaluation**
   Evaluation is carried out to find various potential errors and bugs. At this stage, the validity and reliability tests were carried out on the questionnaire distributed to the Hajj registrants. In addition, other tests were carried out, namely looking for errors when implementing the Fuzzy Service Quality and Importance Performance Analysis methods.

   (a) **Fuzzy Service Quality**
   Fuzzy theory to represent uncertainty related to patience, uncertainty and lack of information about certain elements of the problem at hand. The underlying strength of fuzzy set theory is that it uses linguistic variables rather than quantitative variables to present concepts that are not precession [12]. Determination of the Fuzzy Set is carried out to determine the score of the answers of the Hajj registrants based on the criteria for each of the criteria proposed in the questionnaire. Assurance of the fluffy set should be visible in Figure 2

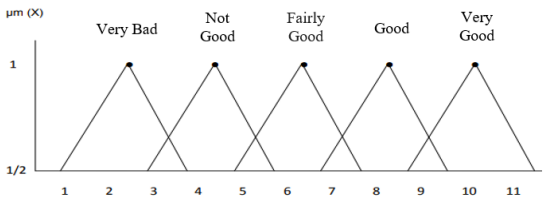


**Figure 2.** System Development Life Cycle Flow Chart

The values used in determining the weights (scores) that we use to determine the level of service quality from the calculation of the fuzzification value are as follows:

i. Category 1 = Very Bad with a score of 1,2,3,4, (Including answers to the Perceptions/Expectations questionnaire, namely Strongly Disagree/Strongly Unexpected).
ii. Category 2 = Not Good with a score of 3,4,5,6 (Including answers to the Perceptions/Expectations questionnaire, namely Disagree/Not Expected).

iii. Category 3 = Fairly Good with a score of 5,6,7,8 (Includes answers to the Perceptions/Expectations questionnaire, namely Agree/Sufficiently Expected).
iv. Category 4 = Good with a score of 7,8,9,10 (Includes answers to the Perceptions/Expectations questionnaire, namely Agree/Sufficiently Expected).
v. Category 5 = Very Good with a score of 9,10,11,12 (Includes answers to the Perception/Expectations questionnaire, namely Strongly Agree/Strongly Expected)

Furthermore, the fuzzification calculation is carried out to obtain the lower limit value(c), the middle limit (a), and the upper limit (b) which are the values of the Triangular Fuzzy Number (TFN). The calculation of the fuzzification value of the questionnaire data is carried out by the following formula in Eq. 1, Eq. 2, and Eq. 3.

$$\text{Lower limit value(c)} = \frac{b_{i1}n_1 + b_{i1}n_2 + b_{i2}n_3 + ... + b_{i(k-1)}n_k}{n_1 + n_2 + ... + n_k} \quad (1)$$

$$\text{Midlle Limit Value (a)} = \frac{b_{i1}n_1 + b_{i2}n_2 + b_{i3}n_3 + ... + b_{ik}n_k}{n_1 + n_2 + ... + n_k} \quad (2)$$

$$\text{Upper Limit Value (b)} = \frac{b_{i2}n_1 + b_{i3}n_2 + b_{i4}n_3 + ... + b_{ik}n_{k-1}}{n_1 + n_2 + ... + n_k} \quad (3)$$

Description:
$b_i$ : average fuzzy set value per level of importance
$n$ : number of respondents per level of importance

After each statement has the difference, the next step is to fuzzified to get a single correct value. Defuzzification is obtained by averaging the lower value, middle value and upper value of each criterion obtained from the triangular fuzzy number value that has been obtained [13].

Service quality is a model developed by Zeithaml, Parasuraman, and Berry (1990) [11]. Servqual is used to calculate the Gap. Gap measurement is the difference between the expected service and the service received by consumers. After getting the next defuzzification value to the Servqual calculation [12]. The Servqual calculation can be calculated by the difference between the value of Reality defuzzification and expected defuzzification. The value of the difference between expectations and the reality of the registrant who has a positive value indicates that the service is felt to be in line with expectations, while if it is negative, it indicates that the service felt by the registrant is not in line with expectations. The following is the Servqual Eq. 4 according to [13].

$$Q = P(\text{Perceived Service} - E(\text{Expected Service})), \quad (4)$$

Description:
Q : Quality of service
P : Reality of service
E : Expectation of service

(b) **Importance Performance Analysis (IPA)**
This method requires measuring the level of conformity to find out how much satisfaction the registrant gets with the existing services at Winning and measuring how much and understanding the Ministry of Religion has of what the registrant wants for the services provided. In the Importance Performance Analysis, mapping is carried out into 4 quadrants for all variables that affect service quality, following the division of quadrants in the importance performance analysis [14]:

i. **Quadrant A (Main Priority)**
In this area contains factors that are considered important by customers, but in fact these factors are not as expected by customers. Variables in this quadrant must be improved by means of periodic improvements so that the performance of variables in this quadrant can increase.

ii. **Quadrant B (Maintain Achievement)**
In this area contains factors that are considered important by customers and these factors are considered by customers to be in accordance with what they feel, so that the level of satisfaction is higher and the variables in this quadrant must be maintained.

iii. **Quadrant C (Low Priority)**
In this area contains factors that are considered less important and in fact their performance is not too special. Increasing the variables included in this quadrant can be reconsidered because the effect felt by the customer is small.

iv. **Quadrant D (Excessive Priority)**
In this area contains factors that are considered less important and customers feel that performance is too excessive. Variables in this quadrant can be reduced by the company in order to save costs.

6. **Validity Test and Reliability Test**
Validity test was conducted to determine the accuracy of each question on the questionnaire distributed by researchers and processed using SPSS software. Validity is showing the degree of accuracy between the data that actually occurs on the object and the data collected by the researcher to find the validity of an item statement after that the item score is correlated with the total number of these items [18]. In this study using a significant level of 5% if the correlation coefficient is low / not significant then the item is declared invalid. From the data processed by SPSS, with N=100 then r table 5% = 0.195. If R count > R table then the statement item is considered valid. One way to test the validity of the questionnaire is to use the Pearson product moment correlation method with the following formula in Eq. 5

$$r\text{Count} = \frac{n\left(\sum xy\right) - \sum x \sum y}{\sqrt{\left(n\sum y^2 (\sum y)^2\right)\left(n\sum y^2 (\sum y)^2\right)}} \tag{5}$$

Description:
$r$ : correlation
$x$ : score of each item
$y$ : total score minus the score for each item
$n$ : sample size

Reliability test was conducted to determine the level of reliability of each question on the questionnaire distributed by researchers. Reliability is the extent to which measurement results using the same object will produce the same data [19]. The method for measuring reliability in this study is Cranbach alpha. The Cranbach alpha formula is as in Eq. 6

$$r_i = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum \sigma^2 b}{\sigma^2 t}\right) \tag{6}$$

Description:

| | | |
|---|---|---|
| $r_i$ | : | eliability coefficient alpha |
| $k$ | : | number of question items |
| $\sum \sigma^2 b$ | : | number of item variants |
| $\sum \sigma^2 t$ | : | total variance |

Reliability testing can be carried out together on all items or questions in the research questionnaire[20]. The basis for making decisions in reliability testing is as follows:

(a) If Cronbach's Alpha value > 0.60 then the questionnaire is declared reliable or consistent.
(b) Meanwhile, if Cronbach's Alpha value < 0.60 then the questionnaire is declared unreliable or consistent.

## 3. Result and Discussion

The phases of exploration to dissect the degree of fulfillment with Hajj Registration Services utilizing the Fuzzy Servqual and IPA technique. Stages begin with entering the preparation of

the questionnaire. Questionnaires in this study that there are 21 statements and data used in data processing as many as 100 respondents. The questionnaire will then go through the stages of validity and reliability testing, if it is not valid and reliable, the questionnaire data will be tested again, after obtaining a valid and reliable questionnaire, then proceed with processing the questionnaire data. Furthermore, the fuzzification calculation process is carried out and the fuzzy expectations and reality fuzzy results are included in the calculation of the gap value for the service quality method. After all, processes starting from the questionnaire data test stage to calculating the gap value using the service quality method, the results of the service quality gap will be displayed in quadrants according to the importance-performance analysis method on the system display. The results of this analysis show the dimensions and aspects that must be improved by the Ministry of Religion Kab. Bogor.

1. **Result of Questionnaire**
   The respondent's answer used is a Likert scale, which is a statement that shows the level of agreement or disagreement with the respondent. The answer scale is 1 -5. The following is the meaning of the scale:
   1 =Very Dissatisfied (VD)
   2 = Unsatisfactory (U)
   3 = Fairly Satisfactory (FS)
   4 = Satisfactory (S)
   5 = Very Satisfactory (VS).

   In this study, the validity and reliability tests used the SPSS 21 application. In this study the questionnaire data was valid and reliable, the validity and reliability tests can be seen in Table 1 and 2.

**Table 1.** Expected Validity Test Results

| No | Statement | R Count | R Table | Description |
|---|---|---|---|---|
| Reliability | | | | |
| 1 | P1 | 0.549 | 0.195 | Valid |
| 2 | P2 | 0.504 | 0.195 | Valid |
| 3 | P3 | 0.623 | 0.195 | Valid |
| 4 | P4 | 0.580 | 0.195 | Valid |
| Responsiveness | | | | |
| 5 | P5 | 0.654 | 0.195 | Valid |
| 6 | P6 | 0.638 | 0.195 | Valid |
| 7 | P7 | 0.658 | 0.195 | Valid |
| 8 | P8 | 0.632 | 0.195 | Valid |
| Guarantee | | | | |
| 9 | P9 | 0.776 | 0.195 | Valid |
| 10 | P10 | 0.577 | 0.195 | Valid |
| 11 | P11 | 0.604 | 0.195 | Valid |
| 12 | P12 | 0.584 | 0.195 | Valid |
| Empathy | | | | |
| 13 | P13 | 0.672 | 0.195 | Valid |
| 14 | P14 | 0.486 | 0.195 | Valid |
| 15 | P15 | 0.693 | 0.195 | Valid |
| 16 | P16 | 0.653 | 0.195 | Valid |
| Physical Evidence | | | | |
| 17 | P17 | 0.726 | 0.195 | Valid |
| 18 | P18 | 0.462 | 0.195 | Valid |
| 19 | P19 | 0.344 | 0.195 | Valid |
| 20 | P20 | 0.465 | 0.195 | Valid |
| 21 | P21 | 0.671 | 0.195 | Valid |

**Table 2.** Reality Validity Test Results

| No | Statement | R Count | R Table | Description |
|---|---|---|---|---|
| Reliability | | | | |
| 1 | P1 | 0.549 | 0.195 | Valid |
| 2 | P2 | 0.504 | 0.195 | Valid |
| 3 | P3 | 0.623 | 0.195 | Valid |
| 4 | P4 | 0.580 | 0.195 | Valid |
| Responsiveness | | | | |
| 5 | P5 | 0.654 | 0.195 | Valid |
| 6 | P6 | 0.638 | 0.195 | Valid |
| 7 | P7 | 0.658 | 0.195 | Valid |
| 8 | P8 | 0.632 | 0.195 | Valid |
| Guarantee | | | | |
| 9 | P9 | 0.776 | 0.195 | Valid |
| 10 | P10 | 0.577 | 0.195 | Valid |
| 11 | P11 | 0.604 | 0.195 | Valid |
| 12 | P12 | 0.584 | 0.195 | Valid |
| Empathy | | | | |
| 13 | P13 | 0.672 | 0.195 | Valid |
| 14 | P14 | 0.486 | 0.195 | Valid |
| 15 | P15 | 0.693 | 0.195 | Valid |
| 16 | P16 | 0.653 | 0.195 | Valid |
| Physical Evidence | | | | |
| 17 | P17 | 0.726 | 0.195 | Valid |
| 18 | P18 | 0.462 | 0.195 | Valid |
| 19 | P19 | 0.344 | 0.195 | Valid |
| 20 | P20 | 0.465 | 0.195 | Valid |
| 21 | P21 | 0.671 | 0.195 | Valid |

From the results of the validity test on the expectation and perception data after comparing the calculated r value with the r table value = 0.195, then all the expectations and perceptions attributes are declared valid, because all the calculated r values are greater than the r table values.

In the reliability test, less than 0.6 is not reliable, while more than 0.6 can be said to be reliable. Reliability testing of the results of the questionnaire was carried out to ensure whether the questionnaire was consistent in measuring the same symptom. For the results of the Output Reliability Statistics using the Cronbach's Alpha technique. The value of Cronbach's Alpha from the results of processing the perception data obtained a value of 0.908 and the expectation is 0.941. Thus, the data is reliable and considered good.

2. **Result of Fuzzy Service Quality**
After processing the data, it can be determined that a negative satisfaction value (0) indicates the quality of service exceeds the level of customer satisfaction. If the satisfaction value is appropriate (=0), it shows that the quality of service is in line with expectations. The results of the Fuzzy Quality service show that the service aspect with the statement that the location of the Ministry of Religion is easy to find (P19) gets the highest gap with a gap value of -2.9 and the service aspect with a statement of accuracy in your data verification process (P3) gets the lowest gap with a gap value of -1 ,42. The results of these scores can be interpreted that the Hajj registrants have high hopes for the Office of the Ministry of Religion Kab. Bogor to make it easier and provide clear office address information because the office location is in the village and there is no office nameplate on the street, because this information is important for far-away Hajj registrants.

3. **Result Of Importance Performance Analysis**
From the results of the analysis of Importance performance analysis through the system, it has been seen that the location of the attributes that enter into each available quadrant. The grouping of attributes as follows:

   (a) **Quadrant A**
   In this quadrant, shows the attributes that affect the satisfaction of Hajj registrants at the Ministry of Religion, this quadrant should be prioritized by the Ministry of Religion because this attribute is considered important by the registrant but the service is still not satisfactory. In this quadrant there are no attributes entered, meaning that there is no unsatisfactory service in the Hajj registration service.

   (b) **Quadrant B**
   In this quadrant, the attributes that affect the satisfaction of registrants at the Ministry of Religion in this quadrant need to be maintained, because the implementation has been in accordance with the interests and expectations of the registrants, so as to satisfy the hajj registrants. Attributes included in quadrant B are Accuracy in the process of verifying your data (P3), Accuracy of service opening and closing hours (P4), Officers are alert in serving the registration process)(P8), Officers have knowledge of registration procedures(P9), You feel safe and comfortable while at the Ministry of Religion(P10), Ministry of Religion officers are always kind and polite to you (P13), Officers pay individual attention to you(P15), Ministry of Religion officers are always nice and polite to you (P16), Facilities within the Ministry of Religion (chairs, tables, bathrooms ,etc.) are clean and in good condition (P17). The first aspect that must be prioritized and must be improved by the Ministry of Religion Kab. Bogor is a statement by the Ministry of Religion officers to always be kind and polite to you (P16). Where the Hajj registrant has different emotional stability or a bad mood due to various factors. Furthermore, what must be maintained in the Hajj registration service is accuracy in the data verification process (P3) and officers have knowledge of registration procedures (P9), all Hajj officers must have knowledge about the world of Hajj, from pre-registration to post-registration.

   (c) **Quadrant C**
   In this quadrant, the attributes that affect the satisfaction of the Hajj registrants in Winning are still considered less important by the Hajj registrants, while the quality of their work is normal or sufficient. Attributes included in quadrant C are The Ministry of Religion officers are dexterous in handling your registration request(P1), Officers have the ability in your registration process(P2). When you need something the staff has time to help you(P7), Friendly staff in serving Hajj registrants (P11), Officers are well-dressed and well-groomed(P12), Officers provide the same service regardless of social status (P14), Ministry of Religion has a comfortable place(P18), locations are easy to find(19), Ministry of Religion officers have a clean and tidy appearance (20). Aspects that must be carried out by Hajj officers are Ministry of Religion officers who are agile in handling requests your registration (P1), the officer has time to help you (P7), looks

clean and tidy (P20) and is friendly in serving Hajj registrants (P11). this is because not all applicants have a stable emotional level.

(d) **Quadrant D**
In this quadrant, the attributes that affect the satisfaction of the Hajj registrants at the Ministry of Religion are considered excessive in their performance, this is mainly because the registrants consider the existence of these attributes not too important, but the implementation is done very well. The attributes included in quadrant D are Not too long in waiting for the photo-taking process (P5), It doesn't take long to wait for your registration/file verification process (P6), The Ministry of Religion has a large and safe parking lot (P21). The first aspect whose service is considered good is that it doesn't take long to wait for photos (5) and the registration/file verification process (6), this is due to the accuracy and speed of the officers in filling out Hajj registrant data, but the officers must pay attention to their accuracy in filling out the data so that the data entered is not wrong and the statement of the Ministry of Religion has a large and safe parking lot (21) it is felt that the Hajj registrar is in line with expectations and it is felt that it is wide enough for the registrant to entrust his vehicle

4. **Evaluation result**
The test is carried out by measuring the presentation of conformity results by comparing the results of the service satisfaction assessment information system with the results of data processing with fuzzy and non-fuzzy. From the results of the suitability test between fuzzy and non-fuzzy, it shows the same output results on all dimensions so it can be concluded that the calculation of the fuzzy servqual method on the system there is no difference between using fuzzy and non-fuzzy but in the per attribute test there are differences in the attributes of the officers who are alert in serving the registration process (P8), Ministry of Religion officers are always nice and polite to you (P16), Ministry of Religion officers are clean and tidy (P20) and Ministry of Religion has a large and safe parking lot (P21).

## 4. Conclusion

This study uses the Servqual method which can determine the satisfaction level of Hajj registrants by distributing questionnaires based on the servqual dimensions and then measuring the value of the gap in the level of performance and satisfaction. Furthermore, the results of the gap values were analyzed using the Importance Performance Analysis method to find out what factors needed to be improved and improved at the Ministry of Religion Kab. Bogor. The results of the application of the fuzzy service quality method through the system produce a service satisfaction value at the Ministry of Religion with the highest service aspect value, namely accuracy in the process of verifying your data (P3) with a gap value of -1.42 and the lowest service aspect, namely the location of the Ministry of Religion is easy to find (P19) with a value of -1. gap of -2.9. The results of the Importance Performance Analysis obtained quadrant A, there are no attributes that fall into this quadrant. Quadrant B has nine items, Quadrant C has nine items, and Quadrant D has three items. This quadrant determines the position of service quality items. Testing the results is done by testing the validation between fuzzy and non-fuzzy results showing the same output on all dimensions of servqual and quadrant IPA so that it can be concluded that there is no difference between using fuzzy and non-fuzzy.

## References

[1] Roswita Romana L, Sebastianus Adi S. Mola, Nelcy D. Rumlaklak. Penerapan Metode Fuzzy Service Quality (Servqual) Untuk Menganalisa Kepuasan Pelayanan Pendidikan Pada Jurusan Ilmu Komputer Fakultas Sains Dan Teknik Universitas Nusa Cendana. *J-ICON*, Vol. 5 No. 2, pp. 48-58. 2017. [Online]. Available: https://ejurnal.undana.ac.id/index.php/jicon/article/view/365/337.

[2] Suharyanta. D, A'yunin. Q. Analisis Tingkat Kualitas Pelayanan Jasa Menggunakan Metode Service Quality (Servqual) Fuzzy Di Instalasi Radiologi

Rumah Sakit Umum Daerah (RSUD) Panembahan Senopati Bantul. Jurnal KESMAS, ISSN: 1978-0575, Vol. 7, No. 1, pp, 27-50. 2011. Online]. Available: http://journal.uad.ac.id/index.php/KesMas/article/view/1047/pdf_2.

[3] Anil Kumar Kalotra, Dr. Nitya Sharm. Measuring Service Quality using SERVQUAL in Hospitality Industry "A Study of Delhi". *International Journal of Emerging Research in Management &Technology.* Vol. 6, No. 1, pp. 63-68. 2017. Online]. Available: https://www.researchgate.net/publication/313533523_Measuring_Service_Quality_using SERVQUAL_in_Hospitality_Industry_A_Study_of_Delhi.

[4] Alireza RM. Measuring Service Quality using Servqual Model: A Case Study of Brokerage Offices in Iran. *International Journal for Quality research.* Vol 6, No. 1, pp. 55-61. 2012. Online]. Available: http://www.ijqr.net/journal/v6-n1/7.pdf

[5] Nugraheni Djamal, Wahyu Oktri Widyarto. Quality Service Measurement using Fuzzy Service Quality (Fuzzy Servqual) Method. *International Journal of Engineering Research & Technology (IJERT).* Vol. 6, No. 06, pp.14-618. 2017. Online]. Available: https://www.ijert.org/research/quality-service-measurement-using-fuzzy-service-quality-fuzzy-servqual-method-IJERTV6IS060271.pdf.

[6] Stefano, N.M, Casarotto Filho, N, Barichello, R, Sohn, A.P. 2015. A fuzzy SERVQUAL based method for evaluated of service quality in the hotel industry. *Procedia CIRP 30,* pp. 433-438. Online]. Available: https://www.sciencedirect.com/science/article/pii/S2212827115004539

[7] Sholikah, H., & Irianandа, S. W. Analisis Kepuasan Pelanggan Travel Menggunakan Metode Fuzzy Service Quality. *JOINTECS (Journal of Information Technology and Computer Science)*, Vol. 2, No. 2, pp. 53-58. 2017. Online]. Available: https://media.neliti.com/media/publications/224618-analisis-kepuasan-pelanggan-travel-mengg-0135dfe4.pdf.

[8] Gwo-Hshiung Tzeng, Hung-Fan Chang. Applying Importance-Performance Analysis as a Service Quality Measure in Food Service Industry. *Journal of Technology Management & Innovation.* 6(3). pp.106-115. 2011. Online]. Available: https://www.researchgate.net/publication/262522406 Applying Importance-Performance Analysis as a Service Quality Measure in Food Service Industry/link/03a2c6bb0cf20bec3b6f0f9a/download.

[9] Marlin YT, Wiranto HU, Rudy L. Analysis of Service Quality Using Servqual Method and Importance Performance Analysis (IPA) In Population Department, Tomohon City. International Journal of Computer Applications. Vol. 70, No. 19, pp. 23-30. 2013. [Online]. Available: https://www.ijcaonline.org/archives/volume70/number19/12175-8152.

[10] [10] Fofaldus Falmon. Penerapan Metode Fuzzy Service Quality (Servqual) Untuk Mengukur Kepuasan Pelayanan Pendidikan Pada Prodi Pendidikan Matematika Universitas Nusa Cendana. Fraktal: *Jurnal Matematika dan Pendidikan Matematika.*Vol. 1, No. 1, pp. 68-78. 2020. [Online]. Available: https://ejurnal.undana.ac.id/index.php/fraktal/article/view/3060.

[11] Nanny Fajar Kartika, Suprayogi. Implementasi Fuzzy - Service Quality Terhadap Tingkat Kepuasan Layanan Mahasiswa. *Jurnal Ilmiah SISFOTENIKA.* Vol. 7, No. 1, pp. 38-49. 2017. [Online]. Available: https://www.stmikpontianak.ac.id/ojs/index.php/ST/article/viewFile/132/126.

[12] Entin Sutinah, Odilia Rosdiana Simamora. Metode Fuzzy Servqual Dalam Mengukur Kepuasan Pasien Terhadap Kualitas Layanan BPJS Kesehatan. *Jurnal Informatika*, Vol.5, No.1, pp. 90-101. 2018. [Online]. Available: https://ejournal.bsi.ac.id/ejurnal/index.php/ji/article/view/INF10.

[13] Zeithaml, V. A., Parasuraman, A., Berry, L. L., & Berry, L. L. *Delivering quality service: Balancing customer perceptions and expectations.* Simon and Schuster. 2010.

[14] Tjiptono, F., & Gregorius, C. 2015. *Strategi Pemasaran*, Edisi IV.Yogyakarta: Penerbit Andi*Journal of marketing*. 41(1), pp.77-79.

[15] Martilla, J. A., & James, J. C. 1977. Importance-performance analysis. *Journal of marketing*, 41(1), pp.77-79.1977. [Online]. Available: https://umnaw.ac.id/wp-content/uploads/2019/02/Importance-performance-analysis_Martilla-James-1977.pdf.

[16] Tjiptono, F., & Gregorius, C. *Strategi Pemasaran*, Edisi IV.Yogyakarta: Penerbit Andi. 2015.

[17] Martilla, J. A., & James, J. C. 1977. Importance-performance analysis. *Journal of marketing,* 41(1), pp.77-79.1977. [Online]. Available: https://umnaw.ac.id/wp-content/uploads/2019/02/Importance-performance-analysis_Martilla-James-1977.pdf

[18] Sugiyono. *Metode Penelitian Kuantitatif, Kualitatif dan R&D*, Cetakan 8. Alfabeta, Bandung. ISBN: 979-8433-64-0. 2014.

[19] Sugiyono. *Metode Penelitian Bisnis: Pendekatan Kuantitatif, Kualitatif, Kombinasi, dan R&D*. Penerbit CV. Alfabeta: Bandung. ISBN: 978-602-289-322-6. 2017.

[20] Sujarweni, V. Wiratna. *Metode Penelitian: Lengkap, Praktis, dan Mudah Dipahami*. Pustaka Baru Press, Yogyakarta. 2014.