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Improving the Quality of Service Using the IPA and PGCV Methods at BPJS Kesehatan, South Tangerang

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Abstract. *BPJS Kesehatan is tasked with administering the health insurance program, or better known as the National Health Insurance (JKN). The problem that occurs is that there are still many community reports indicating that BPJS Health services in Tangerang are still not good. The goal to be achieved by the author is to find out the quality of service that will be provided by the South Tangerang City BPJS Health Service Office to users and provide suggestions for improvement to increase customer satisfaction at the South Tangerang City BPJS Health Service Office. The method used in this paper uses Importance Performance Analysis (IPA) and Potential Gain in Customer Service (PGCV). The results of this study are IPA analysis stating that the majority of services are in quadrant IV, which means that the service is satisfactory but services that are not considered important by customers. While 6 services are considered important by customers but are not satisfactory. Meanwhile, the PGCV analysis stated that long queue waiting times were a top priority for improvement.*

Keywords: *Service Quality; Importance Performance Analysis; PGCV; BPJS Kesehatan.*

I. INTRODUCTION

Badan Penyelenggaran Jaminan Sosial (BPJS) Kesehatan was formed in 2011 through Law no. 24 of 2011. BPJS Kesehatan is tasked with administering the health insurance program, or better known as the Jaminan Kesehatan Nasional (JKN) (Efendy et al., 2022; Mukti et al., 2022; Pujaswari et al., 2020). JKN is social-based health insurance. JKN membership is regulated in clause 14 of Law no. 24 of 2011, which reads: "Everyone, including foreigners who work for a minimum of 6 (six) months in Indonesia, is required to become a participant in the Social Security program."

On this basis, every citizen must register as a member of BPJS Kesehatan. It is common sense that the number of BPJS Kesehatan participants is increasing rapidly, JKN participants until November 2021 have reached 229.51 million people (Andi Nimah Sulfiani, 2021; Sitorus et al., 2020).

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It is not fair if the membership is coercive but the service still has many deficiencies. Research conducted by BPJS Watch East Java through a survey revealed that several East Java BPJS services are not yet good.

To support the performance of BPJS Kesehatan, it has representative offices in each Regency/City. Head Office in the highest hierarchy, then Branch Offices, below which are Service Offices (Permana et al., 2021). Currently, in South Tangerang City there are only Service Offices that are still subservient to the BPJS Tangerang Branch. Public complaints regarding services at the South Tangerang City BPJS Service Office were collected by the Tangerang Public Transparency Watch (Truth) during the period from June to September 2021.

Table 1. Data on BPJS Service Complaints

No	Complaint Contents	Total Complaints
1	Narrow waiting room	21
2	There is no socialization carried out by BPJS regarding information related to payment and maturity as well as policies taken	16
3	Long service in making BPJS cards	10
4	BPJS officers are not friendly	4
5	An online registration server error	2
	Total	**53**

Based on community reports, there are still many indications that BPJS Kesehatan services in Tangerang are still not good. Observations and Focus Group Discussion (FGD) conducted by researchers before the survey found initial findings of problems at the South Tangerang City Health BPJS Service Office.

Based on the problem analysis in this study, will be carried out using the Service Quality method to find out the level of user satisfaction, then using the Importance Performance Analysis (IPA) method to find out indicators that need to be corrected immediately, then proceed with using the Potential Gain in Customer Service (PGCV) method to determine improvement priority (Dewi RM, Lukmandono L, 2021; Mamangkey et al., 2021; Utami & Ismiyah, 2022). The objectives to be achieved in this study are to measure the quality of service provided by the BPJS Kesehatan Service Office in South Tangerang City to users and provide suggestions for improvement to increase customer satisfaction in the BPJS Kesehatan Service Office in South Tangerang City.

II. Research Method

Research Locations

This research is to measure services at the BPJS Kesehatan service office in South Tangerang City. The distribution of this questionnaire was aimed at BPJS users in South Tangerang City, so our research sites were spread over 25 Community Health Centers and 1 Hospital in South Tangerang City.

Type of Research

This study uses a type of quantitative research to measure customer satisfaction. This method describes the problem data that existed and developed at the time the research was carried out (actual data which was then analyzed to test the hypotheses that had been carried out) looked at the situation and collected some data based on the facts that existed at the research site (Andrianto, M. S., Sayekti, A., & Daniel, 2021; Bharathkumar & Gupta, 2020; Dewi & Nugraha, 2021; Hamzah et al., 2022).

Data Types

Data types and sources are described as follows:

a. Data Type. To obtain data that can be verified, relevant and complete, as well as to support the analysis, it is supported by primary data and secondary data
b. Data Source. The data for this research were obtained from respondents, the South Tangerang City BPJS Service Office, Tangsel City Government Branch Offices, literature studies, and various sites.

Sampling technique

This study uses the Slovin formula to determine the number of samples to be studied, with the following formula (Ali et al., 2021; Muslimin et al., 2022; Sari et al., 2021):

$$n = \frac{N}{N.e^2+1} \quad (1)$$

where:

n = number of samples
N = total population
e^2 = desired accuracy limit

The probability technique used is simple random sampling. According to Cooper and Schindler, simple random sampling is a sampling method in which each element of the population has the same opportunity to be selected as a member of the sample taken using a number table/generator

Importance Performace Analysis (IPA)

First, calculate the level of conformity. The conformity level step is the result of a comparison of the performance/implementation score with the importance/expectation score. It is this suitability level that will determine the order of priority of the performance factors being measured. The formula used is (Aghajanzadeh et al., 2022; Deng, 2007; Esmailpour et al., 2020; Lankia et al., 2022):

$$Tki = \frac{Xi}{Yi} . 100\% \quad (2)$$

where:

Tki = Level of conformity of respondents
Xi = Satisfaction level score
Yi = Importance score

Next, the axis (X) will be filled in by the hospital performance level score. The axis (Y) will be filled in by the patient's interest level score using the formula (Gai et al., 2022; Mejia et al., 2022; Mohebifar et al., 2016; Tuan et al., 2022):

$$X = \frac{\sum Xi}{n} \quad dan \quad Y = \frac{\sum Yi}{n} \tag{3}$$

where:

X = average score of satisfaction level

Y = average score of importance level

n = number of respondents

This analysis is to find out which quadrant the service is in. quadrant I where satisfaction is low while the importance is high so it needs improvement, quadrant II is high satisfaction and low interest, quadrant II is low satisfaction and low interest too, and quadrant IV is high satisfaction and high interest. This study used SPSS (Statistical Product and Service Solutions) software in the analysis.

PGCV

PGCV is needed to make improvement priority sequences. 3 stages of calculation must be passed in this analysis. The steps along with the calculation formula are as follows (Galdolage, 2021; Heldt et al., 2021; Mahmud, 2022; Sharmelly & Klarin, 2021):

a. The first step is to calculate Achieve Customer Value (ACV), using the formula below:

$$ACV = \bar{X} \cdot \bar{Y} \tag{4}$$

where:

$\bar{X}$ = Average score of satisfaction level

$\bar{Y}$ = Average importance score

b. The second step, calculate the Ultimate Desire Customer Value (UDCV), with the following formula:

$$UDCV = \bar{Y} \cdot \bar{X}max \tag{5}$$

where:

$\bar{Y}$ = The average importance score

$\bar{X}$max = Maximum satisfaction value with the Likert scale on the questionnaire

c. The final step is to calculate the PGCV, using the following formula:

$$PGCV = UDCV - ACV \tag{6}$$

From this calculation, the service that has the highest PGCV score is the service that is the main priority for improvement.

III. Result and Discussion

Data Adequacy Test

To determine the data on the number of respondents in this study using the slovin formula. The population in this study were BPJS Kesehatan users in Tangerang City, totaling 655,140 users. While the desired accuracy limit is 5%. Then referring to the slovin formula, the following results are obtained:

$$n = \frac{N}{N.e^2 + 1}$$

$$n = \frac{655.140}{655.140 \text{ x } (0{,}05)^2 + 1}$$

$$n = 399{,}75 \text{ (rounded up to 400)}$$

Identification of Attributes and Preparation of Questionnaires

The questionnaire is guided by the five dimensions of quality (Servqual). The attributes proposed in the questionnaire, are:

a. Responsiveness, with attribute P1 (Proactively inform the operational hours of the BPJS Office), P2 (Proactively provide the latest information about policy changes), P3 (Proactively inform about service standards), P4 (Proactively inform about the bill), and P5 (Proactively inform what services are covered by BPJS).
b. Reliability, with attribute P6 (Operational timeliness), P7 (The waiting time is not long (a moment), P8 (Clear registration procedure or not convoluted), P9 (Clear problem-solving procedures), P10 (Online registration is easy and hassle-free), and P11 (Appropriate rates with the services provided).
c. Assurance, with attribute P12 (Service assurance following the procedure), P13 (Convenience for persons with disabilities), P14 (Certainty is well served in health facilities that work with BPJS), P15 (Ease of paying dues), and P16 (Fairness in providing requirements for service).
d. Empathy, with attribute P17 (Officers want to listen to complaints), P18 (Officers patiently serve), P19 (Friendly staff in service, P20 (The

service does not discriminate between users based on their social and economic strata), and P21 (Handling complaints quickly and precisely).

e. Tangible, with attribute P22 (Customer service waiting room is comfortable), P23 (Comfortable waiting area for registration), P24 (Spacious and secure parking area), P25 (Has a clean and comfortable bathroom), P26 (Has special facilities for persons with disabilities) and P27 (Has room signage).

Validity Test

Perception. Calculations from the SPSS software produce r-counts of each attribute. The results of these calculations for all attributes have a greater r-count than r-table. Then all the attributes of the questionnaire are declared valid.

Expectations. The result of the SPSS software application is that the r-count is greater than the r-table, so all the attributes of the questionnaire are declared valid.

Reliability Test

Presepsion. After all the statement attributes have been valid then a reliability test is carried out. The reliability test technique used in this study is an analysis using Cronbach Alpha. This study uses SPSS software to find Cronbach Alpha numbers. Calculation results shown in Table 2.

Table 2. Perception Reliability Test

Reliability Statistics	
Cronbach's Alpha	N of Items
.898	27

From the results of the calculation of the reliability test using the SPSS software, the Cronbach Alpha value was 0.898. When referring to the provisions, the research limit is considered reliable to have an alpha value greater than 0.66. Therefore it can be stated that this study is classified as reliable because the alpha is greater than 0.66.

Expectasion. The reliability test using SPSS stated that this study was reliable because the Cronbach alpha was greater than 0.66.

Table 3. Expectasion Reliability Test

Reliability Statistics	
Cronbach's Alpha	N of Items
.936	27

IPA

First, the calculation of the suitability level. This calculation is done by dividing the perceived value (Xi) by the expected value (Yi), then converted into a percent (%), as shown in Table 5.

Table 4. Calculation of suitability level

Attribute	Tki	Decision-Making Boundary / Tki Average	Decision
P1	84.5%	78.0%	H
P2	70.4%	78.0%	A
P3	75.2%	78.0%	A
P4	77.0%	78.0%	A
P5	73.5%	78.0%	A
P6	84.2%	78.0%	H
P7	67.0%	78.0%	A
P8	74.9%	78.0%	A
P9	74.4%	78.0%	A
P10	79.4%	78.0%	H
P11	83.4%	78.0%	H
P12	84.7%	78.0%	H
P13	64.5%	78.0%	A
P14	76.5%	78.0%	A
P15	86.1%	78.0%	H
P16	84.4%	78.0%	H
P17	84.5%	78.0%	H
P18	81.7%	78.0%	H
P19	79.9%	78.0%	H
P20	78.5%	78.0%	H
P21	75.6%	78.0%	A
P22	81.5%	78.0%	H
P23	78.1%	78.0%	H
P24	79.3%	78.0%	H
P25	78.4%	78.0%	H
P26	61.0%	78.0%	A
P27	87.5%	78.0%	H

If Tki < Average Tki, then improvement/ action is taken (A). If Tki > Average Tki then efforts are made to hold (H).

Second, Cartesian diagram analysis. An explanation of which services are included in quadrants I, II, II, and IV, as shown in Figure .

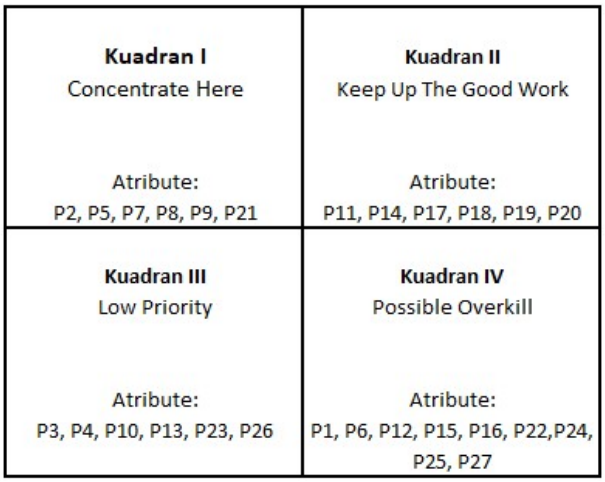

Figure 1. Attributes Based on Quadrants

PGCV

The analysis is used to complement the analysis results from the IPA, to determine priority improvements that must be carried out by the South Tangerang City Health BPJS Service Office. Determine the order of priority based on the size of the PGCV index of a service. The PGCV calculation results can be seen in Table 6.

Quality Improvement Recommendations

Table 6. Attribute Priority Order

Priority	Attribute	Information	PGCV Index
		Quadrant I	
1	P7	The waiting time is not long (a moment)	8.92
2	P2	Proactively provide the latest information about policy changes	8.28
3	P5	Proactively inform what services are covered by BPJS	7.67
4	P9	Clear problem-solving procedures	7.24
5	P21	Handling complaints quickly and precisely	7.16
6	P8	Clear registration procedure (not convoluted)	7.14
Quadrant II			
1	P14	Certainty is well served in health facilities that work with BPJS	6.85
2	P20	between users based on their social and economic strata	6.35
3	P19	Friendly staff in service	6.29
4	P18	Officers patiently serve	5.93
5	P11	Appropriate rates with the services provided	5.71
6	P17	Officers want to listen to complaints	5.33
Quadrant III			
1	P26	Has special facilities for persons with disabilities	10.19
2	P13	Convenience for persons with disabilities	9.53
3	P3	Proactively inform about service standards	7.43
4	P4	Proactively inform about the bill	7.14
5	P10	Online registration is easy and hassle-free	6.85
6	P23	Comfortable waiting area for registration	6.81
Quadrant IV			
1	P25	Has a clean and comfortable bathroom	6.75
2	P24	Spacious and secure parking area	6.56
3	P22	The customer service waiting room is comfortable	6.33
4	P12	Service assurance following the procedure	5.61
5	P6	Operational timeliness	5.68
6	P1	Proactively inform the operational hours of the BPJS Office	5.88
7	P16	Fairness in providing requirements for service	5.55
8	P15	Ease of paying dues	5.20
9	P27	Has room signage	5.00

Table 7. Proposed Service Improvements

Priority	Attribute	Objective Conditions	Proposed Improvements
	Quadrant I (Top Priority for Repair)		
1	P7 = Waiting time is not long (a moment)	Long time to get service	Additional human resources and service office capacity
2	P2 = latest information about policy changes	BPJS does not socialize the latest information about policy changes	Collaborate with health service units to optimize outreach
3	P5 = services are covered by BPJS	There is no publication of information about what services are covered by BPJS	Announcing information online and making leaflets containing information on what services are covered by BPJS
4	P9 = Clear problem-solving procedures	Convoluted problem-handling procedures	Management has increased monitoring to ensure that problems are handled according to procedures
5	P21 = Handling complaints quickly and precisely	Handling of complaints is not fast and precise	Create a joint forum between BPJS Tangerang and the community to coordinate complaints
6	P8 = Clear registration procedure (not convoluted)	The registration procedure is unclear because there is no information about it	Announcing the registration procedure at the registration counter

After the research results are presented. Researchers conducted FGD activities with stakeholders. The following is a formulation of proposed improvements to maintain services. The complete results of the proposal can be seen in Table 7.

IV. Conclusion

The quality of service provided by the South Tangerang City Health BPJS Service Office to users using IPA analysis concludes that the service provided by the South Tangerang City Health BPJS Service Office to BPJS users is satisfactory but the service is not considered important by customers (shown 9 attributes are in quadrant IV). Meanwhile, some services that are considered important are still unsatisfactory, there are 6 services in Quadrant I. The PGCV analysis states that the service that is a priority for improvement in Quadrant I is the short/long waiting time (P7). Proposed improvements that can be given to increase customer satisfaction at the South Tangerang City Health BPJS Service Office. First, the addition of human resources and service office capacity. Second, cooperate with health service units to optimize outreach. Third, announcing information online and making leaflets containing information on what services are covered by BPJS. Fourth, Management has increased monitoring to ensure that problems are handled according to procedures. Fifth, Create a joint forum between BPJS Tangerang and the community to coordinate complaints. Sixth Announce the registration procedure at the registration counter.

References

Ali, B. J., Saleh, P. F., Akoi, S., Abdulrahman, A. A., Muhamed, A. S., Noori, H. N., & Anwar, G. (2021). Impact of Service Quality on the Customer Satisfaction: Case study at Online Meeting Platforms. International Journal of Engineering, Business and Management, 5(2), 65–77. https://doi.org/10.22161/ijebm.5.2.6

Andi Nimah Sulfiani. (2021). Good Governance Penerapan Prinsip-Prinsip Good Governance dalam Pelayanan BPJS Kesehatan Di Kota Palopo. Jurnal Administrasi Publik, 17(1), 95–116. https://doi.org/10.52316/jap.v17i1.59

Andrianto, M. S., Sayekti, A., & Daniel, F. (2021). ANALISIS SIKAP KONSUMEN DI MASA PANDEMI

COVID-19 DAN PENGARUHNYA TERHADAP KEPUTUSAN PEMBELIAN DI COFFEE SHOP JABODETABEK. Jurnal Manajemen Industri Dan Logistik, 05(02), 75–84.

Bharathkumar, S. R., & Gupta, S. (2020). Simplex representation of insurance performance analysis. Journal of Policy Modeling, 42(2), 419–436. https://doi.org/10.1016/j.jpolmod.2019.06.010

Deng, W. (2007). Using a revised importance-performance analysis approach: The case of Taiwanese hot springs tourism. Tourism Management, 28(5), 1274–1284. https://doi.org/10.1016/j.tourman.2006.07.010

Dewi RM, Lukmandono L, P. A. (2021). Penentuan Prioritas Perbaikan Kualitas Public Service dengan Metode Cus-tomer Satisfaction Index, Importance Performance Analysis dan Potential Gain in Customer Value (Studi Kasus: Puskesmas Jagir Surabaya). Seminar Nasional Sains Dan Teknologi Terapan, 1, Oct 8 (Vol. 9, No. 1, pp. 15-21).

Dewi, S. K., & Nugraha, A. (2021). Quality of service evaluation based on importance performance analysis method and the kano model. Journal of Physics: Conference Series, 1764(1), 0–8. https://doi.org/10.1088/1742-6596/1764/1/012199

Efendy, I., Nyorong, M., Amirah, A., & Sari, F. (2022). National Health Insurance (JKN) Mobile Application Use Towards Satisfaction of Participants of the Health Social Security Implementing Agency (BPJS) in Madani Hospital in Medan City. Journal of Medical and Health Studies, 3(1), 26–34. https://doi.org/10.32996/jmhs.2022.3.1.4

Esmailpour, J., Aghabayk, K., Abrari Vajari, M., & De Gruyter, C. (2020). Importance – Performance Analysis (IPA) of bus service attributes: A case study in a developing country. Transportation Research Part A: Policy and Practice, 142(May), 129–150. https://doi.org/10.1016/j.tra.2020.10.020

Gai, S., Fu, J., Rong, X., & Dai, L. (2022). Users' views on cultural ecosystem services of urban parks: An importance-performance analysis of a case in Beijing, China. Anthropocene, 37(October 2021), 100323. https://doi.org/10.1016/j.ancene.2022.100323

Galdolage, B. S. (2021). Barriers for Entering the Digital World: Exploring Customer Value Co-destruction in Self-Service Technologies. FIIB Business Review, 10(3), 276–289. https://doi.org/10.1177/23197145211022016

Hamzah, M. L., Rahmadhani, R. F., & Purwati, A. A. (2022). An Integration of Webqual 4.0, Importance Performance Analysis and Customer Satisfaction Index on E-Campus. Journal of System and Management Sciences, 12(3), 25–50. https://doi.org/10.33168/JSMS.2022.0302

Heldt, R., Silveira, C. S., & Luce, F. B. (2021). Predicting customer value per product: From RFM to RFM/P. Journal of Business Research, 127(March 2018), 444–453. https://doi.org/10.1016/j.jbusres.2019.05.001

Lankia, T., Venesjärvi, R., & Pouta, E. (2022). Importance-performance analysis of the fishing tourism service structure: Recreational anglers' preferences on the remote salmon river of Teno in Finland. Fisheries Research, 254(July). https://doi.org/10.1016/j.fishres.2022.106425

Mahmud, M. (2022). Measuring E-Satisfaction Performance Based on Customer Smart Shopping Feeling and Confident. 06(02).

Mamangkey, E. A. j, Massie, james D. D., & Tawas, H. N. (2021). (Service Quality), Ipa (Importance Performance Analysis) Dan Pgcv (Potential Gain Customer Value) Terhadap Kinerja Pt . Pegadaian (Persero) Cabang Megamas Manado Analysis of Service Quality Using Servqual (Service Quality), Ipa (Importance Perf. Jurnal EMBA, 9(2), 348–358.

Mejia, C., Bąk, M., Zientara, P., & Orlowski, M. (2022). Importance-performance analysis of socially sustainable practices in U.S. restaurants: A consumer perspective in the quasi-post-pandemic context. International Journal of Hospitality Management, 103(March). https://doi.org/10.1016/j.ijhm.2022.103209

Mohebifar, R., Hasani, H., Barikani, A., & Rafiei, S. (2016). Evaluating Service Quality from Patients' Perceptions: Application of Importance–performance Analysis Method. Osong Public Health and Research Perspectives, 7(4), 233–238. https://doi.org/10.1016/j.phrp.2016.05.002

Mukti, A. G., Jaya, C., & Suhard, R. L. (2022). Current condition of social security administrator for health (BPJS Kesehatan) in Indonesia: contextual factors that affected the national health insurance. Medical Journal of Indonesia, 31(2), 87–90. https://doi.org/10.13181/mji.com.226296

Muslimin, R. H., Darmawan, A., Bahri, S., & Rapi, A. (2022). Improving Service Quality Of Delivery Services Based On Heterogeneous Customer Behavior In A Developing Country: A Context During Covid-19. Jurnal Manajemen Industri Dan Logistik, 6(1), 43–64. https://doi.org/10.30988/jmil.v6i1.968

Permana, F. C., Wicaksono, Z. M., Kurniawan, C., Abdullah, A. S., & Ruchjana, B. N. (2021). Perception analysis of the Indonesian society on twitter social media on the increase in BPJS kesehatan

contribution in the Covid 19 pandemic era. Journal of Physics: Conference Series, 1722(1). https://doi.org/10.1088/1742-6596/1722/1/012022

Pujaswari, A. P., Fadila, N., & Febiana, C. (2020). Analisis Kepuasan Pasien Rawat Inap Peserta Badan Penyelenggara Jaminan Sosial (Bpjs) Kesehatan Di Rsud Lembang. Jurnal Menara Medika, 3(1), 66–73. http://jurnal.umsb.ac.id/index.php/menaramedika/article/view/2761

Sari, D., Moeliono, N., Oktafani, F., Fakhri, M., & Novirayanti, R. (2021). Service Quality Analysis with Importance-Performance Analysis at Warunk Upnormal Bandung. Proceedings of the International Conference on Industrial Engineering and Operations Management, 175–179.

Sharmelly, R., & Klarin, A. (2021). Customer Value Creation for the Emerging Market Middle Class: Perspectives from Case Studies in India. Journal of Risk and Financial Management, 14(10), 455. https://doi.org/10.3390/jrfm14100455

Sitorus, B. Y., Soesanto, H., & Kusumawardhani, A. (2020). The Study of Payment Compliance of Independent Workers of National Health Insurance in Bpjs Kesehatan Branch Office Ungaran. Diponegoro Journal of Economic, 9(24), 79–89. https://ejournal3.undip.ac.id/index.php/jme/article/view/31491

Tuan, V. A., Van Truong, N., Tetsuo, S., & An, N. N. (2022). Public transport service quality: Policy prioritization strategy in the importance-performance analysis and the three-factor theory frameworks. Transportation Research Part A: Policy and Practice, 166(October 2021), 118–134. https://doi.org/10.1016/j.tra.2022.10.006

Utami, A. C., & Ismiyah, E. (2022). Evaluasi Kualitas Pelayanan Pelanggan Pada Rumah Makan Barokah Dengan Metode SERVQUAL dan Index Potential Gain Customer Value. Jurnal Serambi Engineering, VII(3), 3466–3472. https://ojs.serambimekkah.ac.id/jse/article/view/4497%0Ahttps://ojs.serambimekkah.ac.id/jse/article/download/4497/3333