An Improvement of Transportation Service Quality By Using Quality Function Deployment Method(Case Study of Mikrolet Public Transportation in Palangkaraya)

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ABSTRACT : *This research aimed to measure and find out the factors that affected the deterioration of service quality of mikrolet public transportation in Palangkaraya, therefore it could be fixed or improved according to the expectations and needs of the passengers. The population of the research was the customers of public transportation of mikrolet Palangkaraya with the sample number of 100 respondents. The sample was taken using non probability accidental sampling technique. The data analysis technique used Importance Performance Analysis (IPA) and Quality Function Deployment (QFD). The research results showed that the service quality of public transportation of mikrolet in Palangkaraya did not satisfy yet. There were 14 priority attributes that needed to be fixed and improved in order to achieve satisfying service. Eighteen technical response activities were needed to be carried out by service providers, operators and the government (Transportation Department) in order to fix and improve transportation services. Through the improvement of service quality of mikrolet public transportation according to the passengers' expectations and needs would attract the public interest on that public transportation in Palangkaraya.*
KEYWORDS:*improvement, service quality, importance performance analysis, quality function deployment.*

I.   INTRODUCTION

Recently, one of the public transportations that was used in Palangkaraya was the passenger car of mikrolet that served several routes and travel routes within the city. Public transportation of mikrolet that has been operating has decreased. Based on the data of Palangkaraya Transportation Department, the number of mikrolet has decreased from 420 units to 230 units in 2016, and nowadays there were only 100 units left. This deterioration was caused by the public's lack of interest in using public transportation. This probability occurred because nowadays there have been many other alternative transportations such as ojek, taxi, online transportation, and specifically the number of private vehicles that have kept increasing in Palangkaraya. The lack of service quality provided by operators was one of the reason why people preferred to use other transportation rather than public transportation. Low quality of service and inability of the entrepreneurs to innovate their units made the service quality got worse. This condition got worse because of the lack of supporting facilities of bus stops and terminals that caused low interest for the people to ride public transportation.

To restore the vitality of the use of public transportation in community, the improvement of service according to the customers' expectations and needs were needed. An effective technique was needed to make it happen so that the needs of transportation customers could be met. Quality Function Deployment (QFD) was a structured method used in planning process and product development to determine the customers' need specifications and expectations, as well as to evaluate the capability of a product or service in fulfilling the customers' needs and expectations systematically (Cohen, 1995). Based on those cases, this research would discuss about the technique in improving service quality of public transportation of mikrolet in Palangkaraya by using Quality Function Deployment (QFD) Method. This method would be integrated with Importance Performance Analysis (IPA) to find out quality level and attributes priority of transportation service that would be fixed or improved.

II. RESEARCH METHODS

The type of this research was descriptive with the combination of qualitative and quantitative data analysis approaches, obtained through questionnaires and in-depth interview. The questionnaires were made based on the information needed to assess the importance level and service performance of mikrolet transportation by using the criteria of Likert Scales 1-5. The questionnaire answers would be analyzed with IPA to find out satisfaction service level and crucial factors in improvement priority. However, the validity and reliability of the instrument should be tested first.

In filling out the answers, the questionnaire was distributed directly to the customers of public transportation services of mikrolet in Palangkaraya who became the respondents. Questionnaires were distributed in places where there were many respondents, such as bus stops, terminals, markets, settlements and other places passed by mikrolet. Accidental sampling technique was used in selecting the respondents, because there was no exact data about the total population. The number of samples was taken until the illustration of the research problem could be met (Amirin, 2011). According to Fraenkel and Wallen in Wagiran (2019), the number of samples taken was 100 respondents in accordance with the recommended minimum sample number of descriptive research.

On the other side, in-depth interview was needed as the material for the preparation of recommendations for improving the quality of mikrolet services. Interview was conducted to drivers as operators, transportation entrepreneurs, and Department of Transportation as the regulator as well as providers of supporting facilities for public transportation such as bus stops and terminals. The results of this interview would be used as Technical Response and Relationship filling in QFD.

The variables observed in this study were the development of the assessment of public perception (passengers) on the performance of mikrolet transportation services in Palangkaraya, referred to the study of Semiun (2013) and the Minimum Urban Transport Service Standards as stated in Regulation of Minister of Transportation Number PM 98 of 2013, as amended by Regulation of the Minister of Transportation Number PM 29 of 2015 concerning Amendment to the Regulation of the Minister of Transportation Number PM 98 of 2013 concerning Minimum Service Standards for Transporting People with Public Motor Vehicles in Route.

III. RESULTS AND DISCUSSION

3.1 Validity and Reliability Test Results

Validity and reliability test used SPSS 18.0 tool to calculate the correlation of *Pearson Product Moment* and *Alpha Cronbach* from the answers to the questionnaire. From the calculation, it was obtained the correlation value of each statement item ranged from 0.382 to 0.767, higher than the critical value of r-table 0.2565 (degrees of freedom N = 100 and significance level α = 0,01), thus it met the validity expectations. Whereas the value of *Cronbach Alpha* (α) was 0.962 which was higher than the required that was 0.6, so the instrument test results were quite good and reliable.

3.2 Determination of Priority for Improvement of Mikrolet Transportation Service Quality

Determining the priority of improving service attributes using IPA through the following procedures:
1. Calculating the level of compatibility and level of the importance of attributes that was studied through the comparison of performance score and importance score (Supranto, 2011), that was:

$$Level\ of\ Compatibility\ (Tki) = \frac{Performance\ Assessment\ Score\ (Xi)}{Importance\ Assessment\ Score\ (Yi)}\ x\ 100\%$$

Table 1. Compatibility Level of Performance and Importance of Palangkaraya Transportation of *Mikrolet*

Service Dimensions	Service Attributes	Average Performance	Average Importance	Compatibility Level (%)
Accessibility	1. *Mikrolet* service time	2,81	3,70	75,95
	2. *Mikrolet* waiting time	2,70	3,76	71,81
	3. Walking distance to *mikrolet*stops	2,72	3,76	72,34
	4. Accessibility to move to other transportation (integrated)	2,82	3,77	74,80
	5. *Mikrolet* travel routes	3,10	3,76	82,45
	6. The length of route passed by *mikrolet*	3,05	3,75	81,33
	7. Time of *mikrolet* to stop at bus stops/terminal	3,03	3,76	80,59
Reliability	8. The availability of transportation	3,31	3,97	83,38
	9. The number of available seat	3,08	4,02	76,62
	10. Punctuality in delivering passengers to their destination	3,09	4,01	77,06
	11. The speed of *mikrolet*	3,07	4,03	76,18
	12. Travel time of *mikrolet*	3,15	4,04	77,97
	13. Time between one *mikrolet* with another one	2,91	3,72	78,23

	14. Environmental factor due to pollution that was caused	2,70	3,99	67,67
Comfort	15. Accessibility to get off the *mikrolet*	3,22	3,99	80,70
	16. Drivers/*kernet* help to get off the passengers/items	2,82	3,89	72,49
	17. Drivers' or *kondektur's* hospitality	3,03	4,04	75,00
	18. Mikrolet driving procedures	2,97	4,13	71,91
	19. Available seats at anytime	2,99	3,96	75,51
	20. Passenger density	2,62	4,06	64,53
	21. Seat quality	2,75	3,86	71,24
	22. Temperature in *Mikrolet*	2,65	4,04	65,59
	23. Cleanliness in *Mikrolet*	2,61	3,99	65,41
	24. Noise in *Mikrolet*	2,85	3,93	72,52
	25. Protection from sunlight	2,84	3,95	71,90
	26. Night lightning in*mikrolet*	2,86	3,90	73,33
	27. Warning of no smoking in *mikrolet*	2,53	4,15	60,96
Security	28. Uniforms and identity of *mikrolet* drivers	2,51	3,78	66,40
	29. Placement of the driver's identity in the wheelhouse	2,56	3,81	67,19
	30. Vulnerability of crimes in *mikrolet*	2,90	4,25	68,24
	31. Vulnerability of crimes by drivers/*kernet*	3,22	4,31	74,71
Safety	32. Speeding and reckless behavior of drivers	3,15	4,36	72,25
	33. Driver behavior that often violates traffic	3,29	4,37	75,29
	34. Drivers' health physically and mentally	3,33	4,27	77,99
	35. Dropping the passengers in the street and random place tempat	3,22	4,22	76,30
	36. *Mikrolet* doors that are closed while moving	2,82	4,01	70,32
	37. Complaint number of *mikrolet*	2,82	4,11	68,61
Affordability	38. Affordability of *mikrolet* existing rates	3,33	4,20	79,29
	39. Unilateral rates by the drivers of *mikrolet*	3,17	4,16	76,20
Vehicle Physical Performance	40. The type of vehicle of *mikrolet*	2,90	3,80	76,32
	41. The appearance of *mikrolet* vehicle	3,00	3,85	77,92
	42. Age of vehicle of *mikrolet*	2,84	4,05	70,12
	43. Vehicle maintenance of *mikrolet*	2,82	4,19	67,30
	44. Feasibility of *mikrolet*	2,91	4,01	72,57
	45. Transport route code board of *mikrolet*	3,15	4,11	76,64
	46. *Mikrolet* is equipped by room temperature regulator	2,50	3,95	63,29
	47. Mikrolet is equipped by audio/video music	2,83	3,83	73,89
	*48. Mikrolet*is equipped with window film	2,76	3,95	69,87
Passenger Waiting Place	49. Bus stops availability	2,89	3,98	72,61
	50. Criteria for building stops	2,72	3,93	69,21
	51. The size of bus stops	2,87	3,98	72,11
	52. The location of bus stops	2,59	3,91	66,24
	53. The interchange of the use of bus stops	2,77	3,91	70,84
	54. The cleanliness of bus stops	2,70	4,13	65,38
	55. The availability of terminal	2,88	4,02	71,64
	56. The criteria of the building of terminal	2,58	4,09	63,08
	57. The size of terminal	2,89	3,88	74,48
	58. The location of terminal	3,01	4,09	73,59
	59. The cleanliness of terminal	2,69	4,14	64,98
Service Information	60. Information of operational hours of *mikrolet*	2,59	4,11	63,02
	61. Information of code, color, and route of *mikrolet*	2,70	4,05	66,67
	62. Information of *mikrolet* rates	2,75	4,21	65,32
	Rata-Rata	**2,89**	**4,00**	**72,32**

Based on Table 1 above, it could be seen that all attributes had a value of compatibility level<100%, indicating that the quality of services provided did not meet the importance of the customer so that the service was still not satisfying yet (Supranto, 2011).
2. Making a Cartesian IPA diagram that was divided into four quadrants, was the result of intersecting the abscissa axis (average score of performance level) and the ordinate axis (average score of importance level), then inserting the average score of each attribute on the diagram. The results of the diagram could be seen in Figure 1.
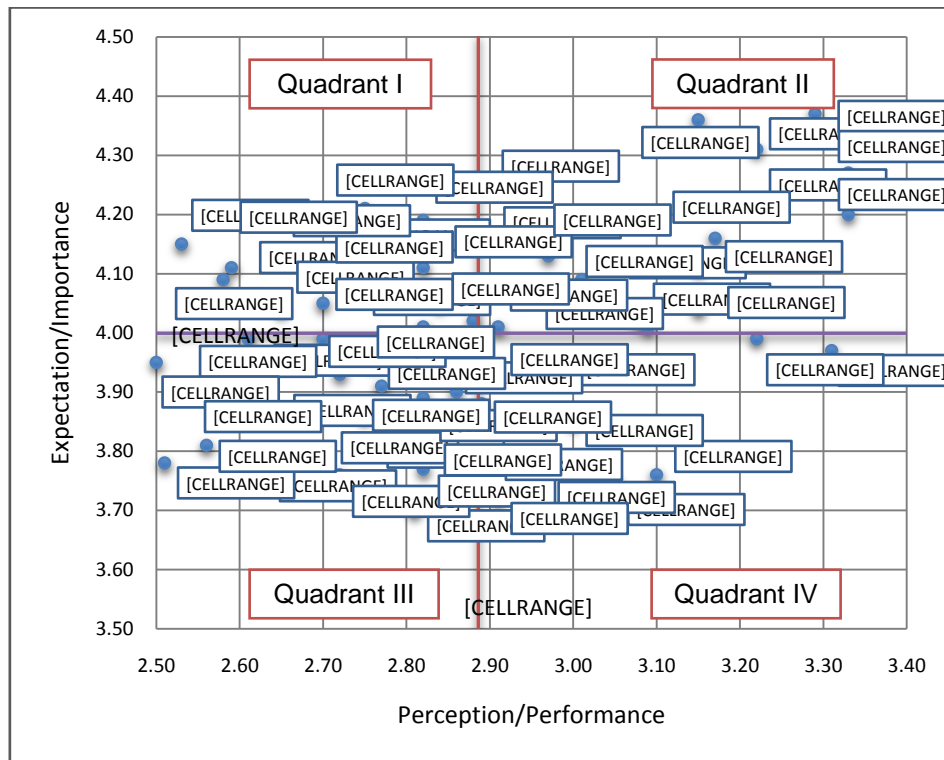
Figure 1. Diagram of *Importance Performance Analysis*

In Figure 1 there were 62 service attributes that had been plotted into IPA quadrant with an explanation of each quadrant as follows:

1. Quadrant I showed that the attributes that were crucial but not in accordance with the expectations of the passenger, so the manager must be able to put more attention and improve these factors again. In this quadrant, attributes included: attributes 20, 22, 27, 36, 37, 42, 43, 54, 55, 56, 59, 60, 61, and 62.
2. Quadrant II showed that the attributes that were also crucial and had been balanced with the quality of service in accordance with the expectations of passengers, so the quality of the attributes in this quadrant must be maintained. Attributes that were in this quadrants included: attributes 9, 10, 11, 12, 17, 18, 30, 31, 32, 33, 34, 35, 38, 39, 44, 45, and 58.
3. Quadrant III showed that the attributes that were not too crucial for the passengers and their performance was not too significant, so the quality in this quadrant did not need to be increased because the effects and benefits experienced by the passengers were very insignificant. Attributes that were in this quadrant included: attributes 1, 2, 3, 4, 14, 16, 21, 23, 24, 25, 26, 28, 29, 46, 47, 48, 50, 51, 52, and 53.
4. Quadrant IV showed attributes that were not crucial but passengers assumed that the managers put too much attention in providing the services. Attributes that were in this quadrant included: attributes 5, 6, 7, 8, 13, 15, 19, 40, 41, 49, and 57.

3.3 Analysis of *Mikrolet* Public Transportation Service Quality Improvement

After knowing the priority of service attributes that must be improved according to the needs and expectations of passengers based on the results of the first quadrant of IPA, then an analysis using QFD was conducted to get recommendations for the repair and improvement of the quality of *mikrolet* service in Palangkaraya. One of the important things in this analysis was to arrange the House of Quality which was an interpretation of QFD. The stages were as follows:

1. The preparation of *Customer Needs* (*Whats*), based on service quality attributes that were in the first quadrant of IPA was interpreted in *Voice of Customers* or also called *Customer Needs*, that were:

Tabel 2. Customers Needs (Whats)

Kode	Customers Needs (WHATs)
C1	The passengers were not crowded
C2	The air inside *mikrolet* was not hot
C3	No smoking in *mikrolet*
C4	The doors of *mikrolet* closed while moving

C5	There was complaint number for dissatisfaction of *mikrolet* service
C6	The age of *mikrolet* was not old
C7	*Mikrolet* was well maintained
C8	The condition of bus stops were clean
C9	There was *mikrolet* terminal
C10	The terminal was equipped with facilities according to SPM
C11	Terminal condition was clean
C12	At bus stops and terminals, there was information of *Mikrolet* operating hours
C13	At the bus stops and terminals there was information of the code, color of the vehicle and the route that was served by *mikrolet*
C14	At bus stops and terminals there was information of *Mikrolet* rates

2. The Determination of *Technical Responses* (*Hows*)

Technical Responses was the efforts to improve services or technical descriptions to answer/meet the needs and expectations of *mikrolet* customers (*Customer Needs*).

Table 3. Technical Responses (Hows)

Kode	Technical Responses (Hows)
T1	Issuance of regulations governing public transportation (*mikrolet*) in Palangkaraya (age restrictions and technical feasibility of transport vehicles, closing doors while moving, etc.)
T2	Socialization of regulation concerning the implementation of public transportation (*Mikrolet*) in Palangkaraya
T3	Control activities of the Department of Transportation to public transportation (*mikrolet*) in Palangkaraya
T4	Commitment of operators and providers to comply with the rules regarding urban transportion operations (*mikrolet*)
T5	Installation of fans
T6	Installation of *Air Conditioner*
T7	Installation of window film on *mikrolet*
T8	Installation of "No Smoking" stickers on *Mikrolet*
T9	Installation of service complaint numbers on *mikrolet*
T10	Innovation of *mikrolet*
T11	Routine maintenance of *mikrolet*
T12	Periodical KIR test by the Department of Transportation
T13	Availability of trash bins at bus stops and terminals
T14	Recruitment of janitor at the bus stops and terminals
T15	Construction of a new terminal for urban transportation
T16	Transfer of *Mikrolet* with facilities according to the Minimum Service Standards
T17	Installation of information boards at the bus stop
T18	Installation of information boards and/or monitor TV in the terminal

3. Determination of *the Relationship Matrix*, described the perceptions of providers, operators and the government (Transportation Department) regarding the relationship between *Voice of Customers* and *Technical Response*. Given the symbol "●" if it has a strong relationship with the value of impact 9, the symbol "○" has a moderate relationship with the value of 3, "Δ" has a weak relationship with the value of 1, and without the symbol (empty) if it has no relationship with the value of 0.

4. Preparation of *Planning Matrix*, based on the value of the level of performance and importance and performance of customer satisfaction according to *Customers Needs*, then planning was carried out to meet the needs according to the expected *target* or *goal*. The calculation column included:

   a. *Importance to Customers (ItC),* taken from the value of the importance level of attributes that that were in the first quadrant of IPA.

   b. *Customer Satisfaction Performance* (*CSP*), taken from the value of the attribute performance level that was in the first quadrant of IPA.

   c. *Goal* (*G*) or target, taken from the value of *Importance to Customers* or *Expected Satisfaction Performance* (customer expectations), because the value of the goal was an achievement that was used as a benchmark of success in efforts to improve service quality.

   d. *Improvement Ratio* (*IR*) was a measure of the effort needed to change the current level of customer perception of the attributes of customer needs to achieve the expected goals. *Improvement Ratio* could be formulated as follows:

$$Improvement\ Ratio\ (IR) = \frac{Goal(G)}{Customer\ Satisfaction\ Performance\ (CSP)}$$

   e. *Sales Point*, in this study were taken all the same, which was equal to 1.5, which meant that management expected a strong point of satisfaction for each customer needs.

   f. *Raw Weight* was a value that described the overall level of importance of each customer's needs based on the level of customer Importance (*Importance to Customer* and *Improvement Ratio*), could be formulated as follows:

$$Raw\ Weight\ (RW) = Importance\ to\ Customer\ (ItC)\ x\ Improvement\ Ratio\ (IR)\ x\ Sales\ Point\ (SP)$$

g. *Normalized Raw Weight* was raw weight expressed in percent or fraction between 0 to 1 or 100%, could be formulated as follows:

$$Normalized\ Raw\ Weight\ (NRW) = \frac{Raw\ Weight\ (RW)}{Total\ Raw\ Weight}$$

h. *Technical Correlation*, used to identify the correlation between each *Technical Response* whether they supported (+) each other or interfered with each other (-) or did not have any correlation at all.

5. Preparation of the *Technical Matrix*, this section contained targets that must be achieved for each *Technical Response*. This targeting was carried out by managers who understood better in the company's capacity in achieving targets. There were three things that included in the *Technical Matrix*, that were:

a. *Contribution* (C), had a function to find out how big the role of each *technical response*. Contribution was obtained from the total Relationship value of each *technical response*. Contribution values could be formulated as follows:

$$Contribution\ (C) = \sum (Normalized\ Raw\ Weight\ \ x\ Impact\ Value)$$

b. *Normalized Contribution* (NC), had a function to find out how much percentage of each *technical response* from the total Contribution. *Normalized Contribution* values could be formulated as follows:

$$Normalized\ Contribution\ (NC) = \frac{Contribution\ (C)}{Total\ Contribution}$$

c. Determining *priority of Technical Response* activities based on the order of *Normalized Contribution* values.

6. The illustration of *House of Quality*
The results of the analysis stage that had been carried out were integrated into The *House of Quality Matrix* as shown in Figure 2.
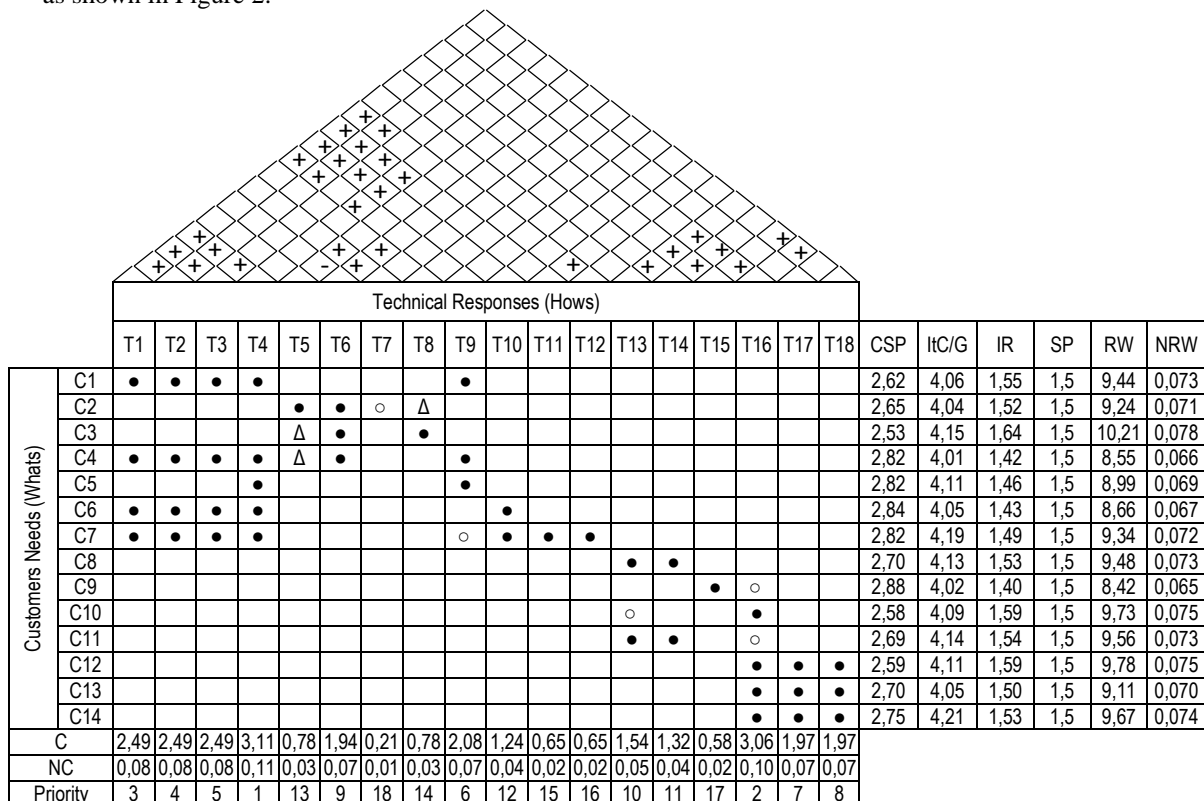

		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	CSP	ItC/G	IR	SP	RW	NRW
	C1	●	●	●	●					●										2,62	4,06	1,55	1,5	9,44	0,073
	C2					●	●	○	Δ											2,65	4,04	1,52	1,5	9,24	0,071
	C3				Δ	●		●												2,53	4,15	1,64	1,5	10,21	0,078
	C4	●	●	●	●	Δ	●			●										2,82	4,01	1,42	1,5	8,55	0,066
	C5					●				●										2,82	4,11	1,46	1,5	8,99	0,069
	C6	●	●	●	●						●									2,84	4,05	1,43	1,5	8,66	0,067
	C7	●	●	●	●					○	●	●	●							2,82	4,19	1,49	1,5	9,34	0,072
	C8													●	●					2,70	4,13	1,53	1,5	9,48	0,073
	C9															●	○			2,88	4,02	1,40	1,5	8,42	0,065
	C10												○				●			2,58	4,09	1,59	1,5	9,73	0,075
	C11													●	●		○			2,69	4,14	1,54	1,5	9,56	0,073
	C12																●	●	●	2,59	4,11	1,59	1,5	9,78	0,075
	C13																●	●	●	2,70	4,05	1,50	1,5	9,11	0,070
	C14																●	●	●	2,75	4,21	1,53	1,5	9,67	0,074
	C	2,49	2,49	2,49	3,11	0,78	1,94	0,21	0,78	2,08	1,24	0,65	0,65	1,54	1,32	0,58	3,06	1,97	1,97						
	NC	0,08	0,08	0,08	0,11	0,03	0,07	0,01	0,03	0,07	0,04	0,02	0,02	0,05	0,04	0,02	0,10	0,07	0,07						
	Priority	3	4	5	1	13	9	18	14	6	12	15	16	10	11	17	2	7	8						

Technical Responses (Hows). Customers Needs (Whats).

Figure 2. *House of Quality*

Figure 2 showed the results of *Contributions* and *Normalized Contributions* as a measure for determining the priority order of the *Technical Response*. The results of this study recommended several activities to service providers and operators as well as the government (Department of Transportation of Palangkaraya) in an effort to improve the quality of *mikrolet* transportation services in Palangkaraya.

3.4 Efforts to Improve Service Providers and Operators

1. Commitment of providers and operators to comply with the rule of the *mikrolet* transportation.
2. Installation of service complaint numbers on *mikrolet*.
3. Installation of *Air Conditioner*.
4. Innovation of *mikrolet*.
5. Installation of fans.
6. Installation of "No Smoking" sticker in *mikrolet*.
7. Routine maintenance of *mikrolet*.
8. Installation of window film according to the provisions.

3.5 Efforts to Improve Service of Palangkaraya Transportation Department

1. Transfer of *mikrolet* terminal with facilities according to the Minimum Service Standards.
2. Issuance of regulations on the implementation of *mikrolet* transportation in Palangkaraya City (age restrictions and vehicle technical feasibility, closing doors while moving, etc.).
3. Socialization activity regarding regulations concerning the implementation of *mikrolet* in Palangkaraya.
4. Control Activity by Transportation Department on *mikrolet* in Palangkaraya.
5. Installation of service complaint numbers on *mikrolet*.
6. Installation of information boards at the bus stop.
7. Installation of information boards and/or monitor TV in the terminal.
8. Provision of trash bins at bus stops and terminals.
9. Periodical KIR Test by Transportation Department.
10. Construction of a new terminal for urban transportation.

IV. CONCLUSION

Based on the results of the analysis and discussion it can be concluded as follows:

1. The compatibility level of each service attribute is less than 100%, indicating that public transportation of *mikrolet* in Palangkaraya does not satisfy the passengers yet.
2. The results of IPA quadrant analysis put 14 attributes as priorities in efforts to improve service quality, including: passenger density, temperature in *mikrolet*, warning of "no smoking" in *mikrolet*, closed door of *mikrolet* while moving, complaint number of *mikrolet* service , age of *mikrolet* transportation vehicles, maintenance of *mikrolet*, bus stop cleanliness, terminal availability, terminal building criteria, terminal cleanliness, information of *mikrolet* operating hours, code information, vehicle color and *mikrolet* routes, and *mikrolet* rates information.
3. Recommendations are given to service providers and operators to make some or all efforts to improve the quality of *mikrolet* services according to ability based on priority technical responses, including: committing to comply with existing regulations, putting a complaint number in the form of a sticker on *mikrolet*, installing Air Conditioner, innovating *mikrolet*, installing fans instead of air conditioners if unable, putting "No Smoking" stickers, maintaining *mikrolet* regularly, and installing window film according to the provisions.
4. Recommendations are given to Palangkaraya Transportation Department to fix and improve *mikrolet* supporting facilities and encourage service providers and operators to improve the quality of their services, including: moving Mihing Manasa Terminal, drafting regional regulations or mayor regulations on urban transportation, increasing the socialization of regulations regarding urban transportation, improving control of urban transportation, putting a complaint number on urban transportation, installing information boards for urban transportation services at the bus stops, installing boards and monitor TV of information services at terminals, providing trash bins at bus stops and terminals, recruiting janitors at the terminal, KIR test for all urban transportions, and planning new terminal for urban transportation according to standards.

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