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Assessment of Toll User Satisfaction in East Java Using Simple Additive Weighting (SAW)

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Abstract

Toll roads are one of the transportation media that can be used to facilitate travel. But only vehicles with at least four wheels can enter the toll road area. Toll roads have several service facilities including transaction services, traffic services, construction services, information services, PJR (Highway Patrol) services, and rest area services. Of these services have service attributes. Where the attributes of the services of the service type can be used as research alternative data. The assessment criteria are the class 1 vehicle satisfaction index and the non-group 1 vehicle index. Then from these criteria and alternatives, it can be done to fill in the value data from the survey results on 95 toll road users from group 1, and 49 toll road users from non-group 1. From the data from the survey results, the data is then indexed. Index data can be used as decision-making value data. With criteria data, alternative data, and value data can be created a decision support system (DSS). The development of DSS can be used for satisfaction analysis which can further provide consideration for the government or toll road managers regarding the types of services that need to be improved. This analysis system uses the Simple Additive Weighting (SAW) method. From the results of the study, recommendations were obtained for each attribute of the type of service that must be prioritized for its implementation.

Keywords: User Satisfaction, Toll Roads, SAW, Service Improvement Recommendations

1. INTRODUCTION

Indonesia is carrying out the development of several infrastructures, such as the construction of roads, buildings, and other infrastructure. Infrastructure development aims to support Indonesia's progress in various sectors. One of the toll road infrastructure development activities aims to support the economic, business, political, and other sectors. Because the Indonesian people need adequate road access for smooth work activities. As the population grows, traffic congestion occurs a lot in various regions, especially during commuting and

returning hours. For this reason, the community needs smooth and good road access in terms of safety, so they need toll roads as a medium to support road transportation.

Toll roads are national roads, where to be able to use toll roads must make payments [1]. The types of vehicles that can pass through toll roads can be divided into several groups, namely Group 1 and Non Group 1. The types of vehicles included in Group 1 include sedans, jeeps, minibuses, SUVs. As for the types of vehicles in the Non-Group 1 group, they include trucks, buses, mini metros, 4 axle vehicles, 5 axle vehicles, and vehicles over 5 axles [2]. The Indonesian government is building toll roads on the island of Java, one of which is the toll road that has the Jakarta to Banyuwangi route. The toll road has a section of the Ngawi to Kertosono toll road. The island of Java is famous for having the most densely populated compared to other parts of Indonesia. People are required by the government to pay taxes every year, including land and building tax, motor vehicle tax, and other taxes. Because the community has carried out tax order, the government must provide facilities, one of which is shown by the construction of toll road access to support community activities. One of the parameters of the successful vision of development is community satisfaction.

Community satisfaction can be seen from the suitability of development results with community expectations. If the development results are not as expected, it can make the community dissatisfied [3]. Public satisfaction with toll roads is the goal of the government for the construction of toll roads. For this reason, the government needs to conduct an analysis of the satisfaction of toll road users. One method of assessing satisfaction can use the method in the decision support system, namely Simple Additive Weighting (SAW). The decision support system is one of the branches of information technology development. The development of information technology can make it easier to solve many problems [4]. In this study, we will create a decision support system to assess the satisfaction of toll road users. From the results of the satisfaction assessment, results were obtained in the form of recommendations for the type of service that must be prioritized for improvement. The types of services on toll roads include transaction services, traffic services, construction services, information services, PJR (Highway Police) services, and rest area services. For alternative data are the services in each type of service. As for the criteria data, it is an assessment of indices from group 1 and non-group. From alternative data and criteria, this study will analyze the satisfaction of toll road users in Java Timus, especially Ngawi-Kertosono with the SAW method, especially satisfaction with resting place services on toll roads.

Several studies related to customer satisfaction and the SAW method have been carried out in recent years. In 2018 there was research on decision support

systems to assess customer satisfaction. The object of the study is the customer satisfaction of minimarkets. In conducting the assessment, researchers use the SAW method. Decision-making criteria include prices, product promos, availability of goods, gifts, and services. With the system built, minimarket owners can find out customer satisfaction [5]. In 2019, research on the development of a system to support consumer satisfaction decisions was carried out at PT. Lotte Shopping Indonesia Bogor. The research used the SAW method. The developed system can help PT. Lotte Shopping Indinesia to find out consumer satisfaction [6]. In the same year there was also research on decision support systems to assess library visitor satisfaction. The survey method is used to obtain the assessment of visitors. Then the visitor value is used as one of the inputs of the decision support system. The study resulted in a decision support system with the SAW method to determine library visitor satisfaction [7].

In 2020, research on the SAW method was conducted for the selection of food crops during the Pandemic. The research built a decision support system for food security. The system uses several criteria including water requirements, management costs, harvest amount, and crop yield. The crops that are the alternative data are rice, sugarcane, and soybeans. The results showed the success of the system in selecting food crops [8]. Research on decision support systems to determine repair priorities, one of which determines the handling of road repairs in the city of Palembang. To determine the priority of which roads to improve, the research uses a decision support system with the SAW method. In addition to research with the SAW method, there is research todetermine the priority of road repair in the Batang Hari Regency Government with the AHP (Analytical Hierarchy Process) method. Decision-making parameters include prioritizing road repairs, traffic volume, costs, and road classification. The results show that the designed system can make decisions on road repair priorities [10].

In 2019, research on toll roads was also made, namely an analysis of the level of public satisfaction with the BECAKAYU (Bekasi-Cawang-Kampung Melayu) toll road tariff policy. The research uses quantitative methods, namely by survey methods through questionnaires. The results of this study are in the form of recommendations to the government on toll tariff adjustments with consideration of road length, service quality, and community capabilities [11]. The analysis of satisfaction levels continued in 2020, which is a study on the analysis of the level of satisfaction of toll road users in the East Java Unit 02 area. The services analyzed are the services of the Highway Patrol Unit of the East Java Regional Police. The methods used by the study were Importance Performance Analysis (IPA) and Customer Satisfaction Index (CSI). From the results of the IPA shows the need for improved services. Meanwhile, the CSI results show that road users already have satisfaction with the service [12].

2. METHODS

The methods used at these stages of research include data collection, data indexing, and system development. For a detailed explanation of the stages of research, namely:

1. 1.Data collection, the data collection stage is carried out using survey methods and available secondary data. The survey method is used to find out the value data, while the secondary data is related to the facilities available at the toll road rest area. Data used for group 1 and non-group 1 vehicles.
2. 2.Data indexing, the data indexing stage is used to make survey data into data that has an index between 1 and 6. Then the results are averaged against the entire number of vehicles for the survey.
3. 3.System development, For the stages of system development, among others:
   a. System needs analysis, which defines the needs needed by the system such as the functional needs of the system, and the non-functional needs of the system.
   b. System design, which is the stage of designing a decision support system for the Ngawi-Kertosono Toll Road User Satisfaction Assessment with the Simple Additive Weighting Method with DFD (Data Flow Diagram).
   c. System Creation, which is the stage where the decision support system for assessing user satisfaction of the Ngawi-Kertosono Toll Road with the Simple Additive Weighting Method is implemented with the web programming language and the MySQL database. The calculation of the SAW method is as follows [13]:

      1. Determination of criteria
      2. Calculation of normalization
      3.

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{Max(x_{ij})} & \text{benefit} \\ \dfrac{Max(x_{ij})}{x_{ij}} & \text{cost} \end{cases} \quad (1)$$

r_{ij} = the result of the calculation of normalization
Max_{ij} = largest value of rows and columns
Min_{ij} = the smallest value of rows and columns
x_{ij} = column row value

3. Calculation of alternative preferences

$$V_i = \sum_{j=1}^{n} W_i \bullet R_{ij} \quad (2)$$

V_i = final preference weight
w_i = weights for calculation
r_{ij} = the result of the calculation of normalization

4. Perankingan

3. RESULTS AND DISCUSSION

This study used data from the results of a survey of users of the Ngawi-Kertosono toll road in East Java. The criteria used are class 1 and non-group 1 vehicles. The survey was conducted on 95 class 1 vehicles and 49 non-group 1 vehicles. As for the alternatives used, they are in the form of types of services on toll roads. For data from survey results from users of the Ngawi-Kertosono toll road in East Java on the types of services can be seen in Table 1, Table 2, Table 3, Table 4, Table 5, Table 6, Table 7, Table 8, Table 9, Table 10, Table 11, and Table 12.

Table 1. Results of the Group 1 Vehicle Transaction Service Survey

Number	Services	6	5	4	3	2	1
1	Speed of Service when paying at Toll Gate (<10 sec)	55	14	21	5		
2	Handling queues when paying Tolls (< 10 Vehicles)	63	16	13	3		
3	Availability of electronic money top up services at toll gates	51	19	25			
4	Friendliness and courtesy of officers when assisting transactions at toll gates	57	20	16	2		

Based on Table 1, the results of the group 1 vehicle transaction service survey were obtained. Each customer can provide a survey of each type of vehicle transaction service by assessing 6, 5, 4, 3, 2, or 1.

Table 2. Results of the Non-Group 1 Vehicle Transaction Service Survey

Number	Services	6	5	4	3	2	1
1	Speed of Service when paying at Toll Gate (<10 sec)	34	7	8			
2	Handling queues when paying Tolls (< 10 Vehicles)	33	6	10			
3	Availability of electronic money top up services	34	7	8			

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Number	Services	6	5	4	3	2	1
	at toll gates						
4	Friendliness and courtesy of officers when assisting transactions at toll gates	31	5	11	2		

Based on Table 2, the results of the non-group 1 vehicle transaction service survey were obtained. Each customer can provide a survey of each type of vehicle transaction service by assessing 6, 5, 4, 3, 2, or 1.

Table 3. Results of the Group 1 Vehicle Traffic Service Survey

Number	Services	6	5	4	3	2	1
1	Speed of handling travel disturbances by Toll Road Patrol Officers (< 30 minutes)	47	13	30	5		
2	Speed of handling trip interruptions (strikes) by Crane Officers (< 30 minutes) and free	39	18	37	1		
3	Handling of travel disturbances on toll roads such as: pedestrians, motorcycles, livestock, and other objects	48	18	27	2		
4	Friendliness and courtesy of toll road service officers (Toll Road Patrol and Crane)	49	21	24	1		
5	Smoothness, Safety and Comfort when passing the toll road	63	19	12	1		

Based on Table 3, the results of the group 1 vehicle traffic service survey were obtained. Each customer can provide a survey of each type of vehicle traffic service by rating 6, 5, 4, 3, 2, or 1.

Table 4. Results of the Non-Group 1 Vehicle Traffic Service Survey

Number	Services	6	5	4	3	2	1
1	Speed of handling travel disturbances by Toll Road Patrol Officers (< 30 minutes)	30	5	14			
2	Speed of handling trip interruptions (strikes) by Crane Officers (< 30 minutes) and free	26	8	15			
3	Handling of travel disturbances on toll roads such as: pedestrians, motorcycles, livestock, and other objects	33	4	11	1		
4	Friendliness and courtesy of toll road service officers (Toll Road Patrol and Crane)	31	6	11	1		
5	Smoothness, Safety and Comfort when passing the toll road	39	3	7			

Based on Table 4, the results of the non-group 1 vehicle traffic service survey were obtained. Each customer can provide a survey of each type of vehicle traffic service by rating 6, 5, 4, 3, 2, or 1.

Table 5. Results of the Group 1 Vehicle Construction Service Survey

Number	Services	6	5	4	3	2	1
1	The surface of the Ngawi-Kertosono toll road is not bumpy and comfortable to walk on	41	18	26	10		
2	The markings of the Ngawi-Kertosono toll road are good and reflective	57	16	21	1		
3	Good lighting on the Ngawi-Kertosono toll road at toll gates and access interchanges	48	14	26	6	1	
4	Greenery along the toll road provides comfort and beauty	27	11	28	27	2	

Based on Table 5, the results of the group 1 vehicle construction service survey were obtained. Each customer can provide a survey of each type of vehicle construction service by rating 6, 5, 4, 3, 2, or 1.

Table 6. Results of the Survey of Non-Group 1 Vehicle Construction Services

Number	Services	6	5	4	3	2	1
1	The surface of the Ngawi-Kertosono toll road is not bumpy and comfortable to walk on	32	7	9			1
2	The markings of the Ngawi-Kertosono toll road are good and reflective	39	2	7			1
3	Good lighting on the Ngawi-Kertosono toll road at toll gates and access interchanges	33	8	5			1
4	Greenery along the toll road provides comfort and beauty	10	11	18			1

Based on Table 6, the results of the non-group 1 vehicle construction service survey were obtained. Each customer can provide a survey of each type of vehicle construction service by rating 6, 5, 4, 3, 2, or 1.

Table 7. Results of the Group 1 Vehicle Information Service Survey

Number	Services	6	5	4	3	2	1
1	The toll road information service through the number phone is easy to contact	43	11	38	2	1	
2	Information on toll road conditions via VMS and Twitter is informative and clear	50	12	30	3		

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Number	Services	6	5	4	3	2	1
3	The writing on the appeal banner is informative and clear	45	19	29	2		

Based on Table 7, the results of the group 1 vehicle information service survey were obtained. Each customer can provide a survey of each type of vehicle information service by rating 6, 5, 4, 3, 2, or 1.

Table 8. Results of the Non-Group 1 Vehicle Information Service Survey

Number	Services	6	5	4	3	2	1
1	The toll road information service through the number phoneis easy to contact	24	2	23			
2	Information on toll road conditions via VMS and Twitter is informative and clear	36	3	9	1		
3	The writing on the appeal banner is informative and clear	35	5	8	1		

Based on Table 8, the results of the non-group 1 vehicle information service survey were obtained. Each customer can provide a survey of each type of vehicle information service by rating 6, 5, 4, 3, 2, or 1.

Table 9. Results of the Highway Police Service Survey (PJR) Vehicles Group 1

Number	Services	6	5	4	3	2	1
1	Toll Road PJR officers have served well and friendly	51	18	23	3		
2	Handling traffic violations by Toll Road PJR officers according to your type of violation	51	15	28	1		

Based on Table 9, the results of a survey of road police services on class 1 vehicles were obtained. Each customer can provide a survey of each type of highway police service by rating 6, 5, 4, 3, 2, or 1.

Table 10. Results of the Highway Police Service Survey (PJR) of Non-Class 1 Vehicles

Number	Services	6	5	4	3	2	1
1	Toll Road PJR officers have served well and friendly	24	8	15	2		
2	Handling traffic violations by Toll Road PJR officers according to your type of violation	25	5	16	3		

Based on Table 10, the results of a survey of road police services on non-class 1 vehicles were obtained. Each customer can provide a survey of each type of highway police service by rating 6, 5, 4, 3, 2, or 1.

Table 11. Results of the Group 1 Vehicle Rest Area Service Survey

Number	Services	6	5	4	3	2	1
1	Condition of access in and out in good condition	59	19	15	1	1	
2	Clean and comfortable toilet conditions	63	10	20		2	
3	The type of restaurant in the rest area is varied, clean & comfortable	49	10	26	8	2	
4	Availability of a large parking space	63	16	13	3		
5	Rest area lighting conditions, good	60	23	11	1		

Based on Table 11, the results of the resting place service survey of class 1 vehicles were obtained. Each customer can provide a survey of each type of rest area service by rating 6, 5, 4, 3, 2, or 1.

Table 12. Results of the Non-Group 1 Vehicle Rest Area Service Survey

Number	Services	6	5	4	3	2	1
1	Condition of access in and out in good condition	35	7	6	1		
2	Clean and comfortable toilet conditions	38	6	4	1		
3	The type of restaurant in the rest area is varied, clean & comfortable	22	3	20	4		
4	Availability of a large parking space	35	8	5	1		
5	Rest area lighting conditions, good	40	4	4	1		

Based on Table 12, the results of a survey of resting place services for non-group 1 vehicles were obtained. Each customer can provide a survey of each type of rest area service by rating 6, 5, 4, 3, 2, or 1. The data obtained from the survey results in Table 1, Table 2, Table 3, Table 4, Table 5, Table 6, Table 7, Table 8, Table 9, Table 10, Table 11, and Table 12, then indexing is carried out by calculating the average of each type of service. Indexing is carried out on data from surveys of group 1 vehicles and non-group 1 vehicles. The average value of the index is used for value data that can then be used for decision making. For the value data of the results of the ordering resultscan be seen in Table 13, Table 14, Table 15, Table 16, Table 17, Table 18, Table 19, Table 20, Table 21, Table 22 Table 23, and Table 24.

Table 13. Indexing the Results of the Vehicle Transaction Service Survey Group 1

Number	Services	Average value
1	Speed of Service when paying at Toll Gate (<10 sec)	5.253
2	Handling queues when paying Tolls (< 10 Vehicles)	5.463
3	Availability of electronic money top up services at toll gates	5.274
4	Friendliness and courtesy of officers when assisting transactions at toll gates	5.389

Table 13 shows indexing data from the results of a survey of group 1 vehicle transaction services. The average value is obtained from the sum result between each value of the multiplication of the type of service with the selected score, then divided by the total number of customers surveyed.

Table 14. Indexing the Results of the Survey of Non-Group 1 Vehicle Transaction Services

Number	Services	Average value
1	Speed of Service when paying at Toll Gate (<10 sec)	5.531
2	Handling queues when paying Tolls (< 10 Vehicles)	5.469
3	Availability of electronic money top up services at toll gates	5.531
4	Friendliness and courtesy of officers when assisting transactions at toll gates	5.327

Table 14 shows indexing data from the results of a survey of non-group 1 vehicle transaction services. The average value is obtained from the sum result between each value of the multiplication of the type of service with the selected score, then divided by the total number of customers surveyed.

Table 15. Indexing of Vehicle Traffic Service Survey Results Group 1

Number	Services	Average value
1	Speed of handling travel disturbances by Toll Road Patrol Officers (< 30 minutes)	5.074
2	Speed of handling trip interruptions (strikes) by Crane Officers (< 30 minutes) and free	5.000
3	Handling of travel disturbances on toll roads such as: pedestrians, motorcycles, livestock, and other objects	5.179

Number	Services	Average value
4	Friendliness and courtesy of toll road service officers (Toll Road Patrol and Crane)	5.242
5	Smoothness, Safety and Comfort when passing the toll road	5.516

Table 15 shows indexing data from the results of a survey of class 1 vehicle traffic services. The average value is obtained from the sum result between each value of the multiplication of the type of service with the selected score, then divided by the total number of customers surveyed.

Table 16. Indexing the Results of the Non-Group 1 Vehicle Traffic Service Survey

Number	Services	Average value
1	Speed of handling travel disturbances by Toll Road Patrol Officers (< 30 minutes)	5.327
2	Speed of handling trip interruptions (strikes) by Crane Officers (< 30 minutes) and free	5.224
3	Handling of travel disturbances on toll roads such as: pedestrians, motorcycles, livestock, and other objects	5.408
4	Friendliness and courtesy of toll road service officers (Toll Road Patrol and Crane)	5.367
5	Smoothness, Safety and Comfort when passing the toll road	5.653

Table 16 shows indexing data from the results of a survey of non-group 1 vehicle traffic services. The average value is obtained from the sum result between each value of the multiplication of the type of service with the selected score, then divided by the total number of customers surveyed.

Table 17. Indexing the Results of the Vehicle Construction Service Survey Group 1

Number	Services	Average value
1	The surface of the Ngawi-Kertosono toll road is not bumpy and comfortable to walk on	4.947
2	The markings of the Ngawi-Kertosono toll road are good and reflective	5.358
3	Good lighting on the Ngawi-Kertosono toll road at toll gates and access interchanges	5.074
4	Greenery along the toll road provides comfort and beauty	4.358

Table 17 shows indexing data from the results of a survey of class 1 vehicle construction services. The average value is obtained from the sum result between each value of the multiplication of the type of service with the selected score, then divided by the total number of customers surveyed.

Table 18. Indexing of Non-Vehicle Construction Service Survey Results Group 1

Number	Services	Average value
1	The surface of the Ngawi-Kertosono toll road is not bumpy and comfortable to walk on	5.388
2	The markings of the Ngawi-Kertosono toll road are good and reflective	5.571
3	Good lighting on the Ngawi-Kertosono toll road at toll gates and access interchanges	5.408
4	Greenery along the toll road provides comfort and beauty	4.388

Table 18 shows indexing data from the results of a survey of non-group 1 vehicle construction services. The average value is obtained from the sum result between each value of the multiplication of the type of service with the selected score, then divided by the total number of customers surveyed.

Table 19. Indexing of Vehicle Information Service Survey Results Group 1

Number	Services	Average value
1	The toll road information service through the number phone is easy to contact	4.979
2	Information on toll road conditions via VMS and Twitter is informative and clear	5.147
3	The writing on the appeal banner is informative and clear	5.126

Table 19 shows indexing data from the results of a survey of group 1 vehicle information services. The average value is obtained from the sum result between each value of the multiplication of the type of service with the selected score, then divided by the total number of customers surveyed.

Table 20. Indexing of Non-Vehicle Information Service Survey Results Group 1

Number	Services	Average value
1	The toll road information service through the number 08113373 301 is easy to contact	5.020
2	Information on toll road conditions via VMS and Twitter @ngawikertosono is informative and clear	5.510
3	The writing on the appeal banner is informative and clear	5.510

Table 20 shows indexing data from the results of a survey of non-group 1 vehicle information services. The average value is obtained from the sum result between each value of the multiplication of the type of service with the selected score, then divided by the total number of customers surveyed.

Table 21. Indexing of The Results of the Highway Police Service Survey (PJR) Of Class 1 Vehicles

Number	Services	Average value
1	Toll Road PJR officers have served well and friendly	5.232
2	Handling traffic violations by Toll Road PJR officers according to your type of violation	5.221

Table 21 shows indexing data from the results of a survey of road police services for class 1 vehicles. The average value is obtained from the sum result between each value of the multiplication of the type of service with the selected score, then divided by the total number of customers surveyed.

Table 22. Indexing the Results of the Highway Police Service Survey (PJR) of Non-Class 1 Vehicles

Number	Services	Average value
1	Toll Road PJR officers have served well and friendly	5.102
2	Handling traffic violations by Toll Road PJR officers according to your type of violation	5.061

Table 22 shows indexing data from the results of a survey of road police services on non-group 1 vehicles. The average value is obtained from the sum result between each value of the multiplication of the type of service with the selected score, then divided by the total number of customers surveyed.

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Table 23. Indexing of Vehicle Rest Area Service Survey Results Group 1

Number	Services	Average value
1	Condition of access in and out in good condition	5.411
2	Clean and comfortable toilet conditions	5.389
3	The type of restaurant in the rest area is varied, clean & comfortable	5.011
4	Availability of a large parking space	5.463
5	Rest area lighting conditions, good	5.495

Table 23 shows indexing data from the results of a survey of the services of class 1 vehicle rest areas. The average value is obtained from the sum result between each value of the multiplication of the type of service with the selected score, then divided by the total number of customers surveyed.

Table 24. Indexing the Results of the Non-Group 1 Vehicle Rest Area Service Survey

Number	Services	Average value
1	Condition of access in and out in good condition	5.551
2	Clean and comfortable toilet conditions	5.653
3	The type of restaurant in the rest area is varied, clean & comfortable	4.878
4	Availability of a large parking space	5.571
5	Rest area lighting conditions, good	5.694

Table 24 shows indexing data from the results of a survey of the services of non-group 1 vehicle rest areas. The average value is obtained from the sum result between each value of the multiplication of the type of service with the selected score, then divided by the total number of customers surveyed.
After conducting a survey, then analyze the needs. The needs of the system in question include the need for software and devices for the system. For the software used, among others:

-Mozilla Firefox browser, -Notepad++, -Dreamweaver, and -Xampp

In addition to software, building a system also requires hardware, including:

-Leptop/ PC Computer, -Processor core-i5, -4 Gb RAM, -Hdd 1 TB

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One of the system designs can use Data Flow Diagrams (DFD). DFD design has a level of 0 which is in the form of a Diagram Context. For DFD Level 0 can be seen in Figure 1.

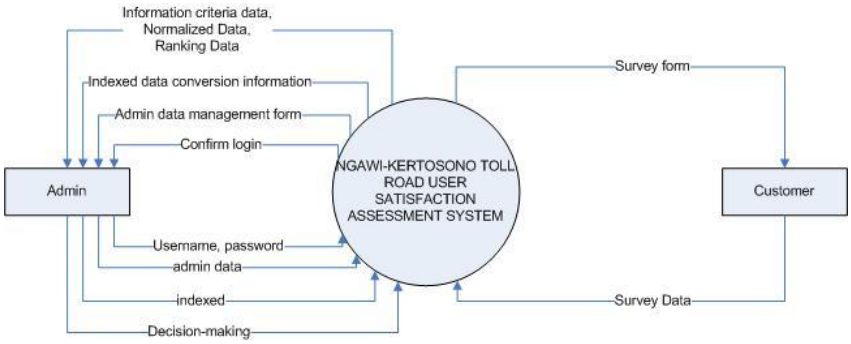

Figure 1. DFD Level 0

The system is built with web programming and the My SQL database. The construction of the system based on the design of the system. Here are the views and assessment process of the survey. On the System Homepage, if the user is not an admin, then the user is considered a customer who will conduct a satisfaction survey. But if the user is an admin, you can login by pressing the login button. To be able to log in, admins can enter a username and password. Then the admin can log in to the system. After the admin signs in, the admin goes into the admin home view. Then get a message if to manage data admin can press the manage admin button. If the admin wants to do indexing, the admin can press calculate index. If an admin wants to decide, the admin can press the make up the decision button. For how it looks can be seen in Figure 2.

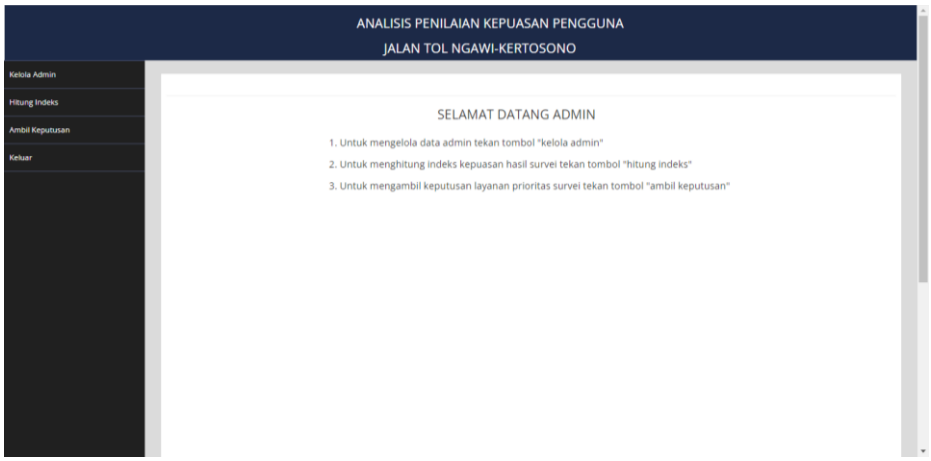

Figure 2. Beranda Admin

In managing admin data, admins can add, change, and delete. Then the admin can do the indexing by breaking the calculate index button. Then the system automatically performs an average of the values of the survey results. For the appearance of the program can be seen in Figure 3.

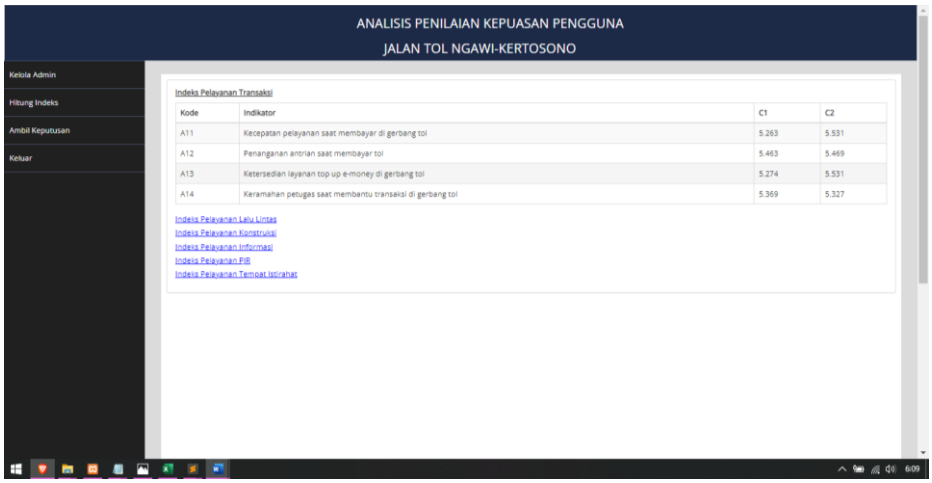

Figure 3. Admin Melakukan Pengindeksan

Admins making decisions require criteria and alternatives. For alternative tables used can be seen in Table 25, and the criteria table can be seen in Table 26. The Alternatives table contains numbers, survey indicators, and alternatid codes. While the criteria table contains the criteria name, criteria code, Attribute (Cost or Benefit), and weight.

Table 25. Alternative Data

Number	Indicator	Alternatif Code
I. Transaction Service		
1	Speed of Service when paying at Toll Gate (<10 sec)	A11
2	Handling queues when paying Tolls (< 10 Vehicles)	A12
3	Availability of electronic money top up services at toll gates	A13
4	Friendliness and courtesy of officers when assisting transactions at toll gates	A14
II. Traffic Service		
1	Speed of handling travel disturbances by Toll Road Patrol Officers (< 30 minutes)	A21
2	Speed of handling trip interruptions (strikes) by Crane Officers (< 30 minutes) and free	A22

Number	Indicator	Alternatif Code
3	Handling of travel disturbances on toll roads such as: pedestrians, motorcycles, livestock, and other objects	A23
4	Friendliness and courtesy of toll road service officers (Toll Road Patrol and Crane)	A24
5	Smoothness, Safety and Comfort when passing the toll road	A25
III. Construction Services		
1	The surface of the Ngawi-Kertosono toll road is not bumpy and comfortable to walk on	A31
2	The markings of the Ngawi-Kertosono toll road are good and reflective	A32
3	Good lighting on the Ngawi-Kertosono toll road at toll gates and access interchanges	A33
4	Greenery along the toll road provides comfort and beauty	A34
IV. Information Service		
1	The toll road information service through the number phoneis easy to contact	A41
2	Information on toll road conditions via VMS and Twitter is informative and clear	A42
3	The writing on the appeal banner is informative and clear	A43
V. PJR Service		
1	Toll Road PJR officers have served well and friendly	A51
2	Handling traffic violations by Toll Road PJR officers according to your type of violation	A52
VI. Rest Service		
1	Condition of access in and out in good condition	A61
2	Clean and comfortable toilet conditions	A62
3	The type of restaurant in the rest area is varied, clean & comfortable	A63
4	Availability of a large parking space	A64
5	Rest area lighting conditions, good	A65

Table 25 shows alternatives that will be used as decision-making targets. Where the data contains an alternative name which is the name of the type of service and the alternative code.

Table 26. Criteria Data

Code	Criteria Name	Atribute	Weight
C1	Satisfaction index in Group 1	Cost	0.5

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Code	Criteria Name	Atribute	Weight
C2	Satisfaction index in Non Group 1	Cost	0.5

Table 26 shows the criteria data as criteria for decision making. The criteria are divided into two, namely the type of vehicle of group 1 and the type of vehicle of non-group 1. In addition to criteria data and alternative data, there is also value data. Value data is data from surveys that have been indexed. An alternative value to each criterion. Value data can be seen in Table 27.

Table 27. Value Data

	C1	C2
A11	5.253	5.531
A12	5.463	5.469
A13	5.274	5.531
A14	5.389	5.327
A21	5.074	5.327
A22	5.000	5.224
A23	5.179	5.408
A24	5.242	5.367
A25	5.516	5.653
A31	4.947	5.388
A32	5.358	5.571
A33	5.074	5.408
A34	4.358	4.388
A41	4.979	5.020
A42	5.147	5.510
A43	5.126	5.510
A51	5.232	5.102
A52	5.221	5.061
A61	5.411	5.551
A62	5.389	5.653
A63	5.011	4.878
A64	5.463	5.571
A65	5.495	5.694

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After the criteria data, alternative data, and value data are determined, then normalization calculations are carried out in the process of the SAW method. Because assuming that after the analysis is carried out, then it is decided on the type of service to be repaired first. For the calculation of normalization with the cost criterion using formula 1. The normalization calculation in this study is:

$$R_{A11.1} = \frac{Min(nilaiC1)}{5.253} = \frac{4.358}{5.253} = 0.830$$

$$R_{Ai1.2} = \frac{Min(nilaiC2)}{5.531} = \frac{4.388}{5.531} = 0.793$$

The meaning of $R_{A11.1}$ is the normalization of R from A11 against C1, while $R_{A11.2}$ is the normalization of R from A11 against C2. Normalization calculations are carried out onwards up to $R_{A65.1}$ and $R_{A65.2.}$ For The full results of the normalization calculation can be seen in Table 28.

Table 28. Normalization Results

R	C1	C2
RA11	0.830	0.793
RA12	0.798	0.802
RA13	0.826	0.793
RA14	0.809	0.824
RA21	0.859	0.824
RA22	0.872	0.840
RA23	0.841	0.811
RA24	0.831	0.817
RA25	0.790	0.776
RA31	0.881	0.814
RA32	0.813	0.788
RA33	0.859	0.811
RA34	1.000	1.000
RA41	0.875	0.874
RA42	0.847	0.796
RA43	0.850	0.796
RA51	0.833	0.860

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R	C1	C2
RA52	0.835	0.867
RA61	0.805	0.790
RA62	0.809	0.776
RA63	0.870	0.900
RA64	0.798	0.788
RA65	0.793	0.771

The next stage in decision making is the calculation of preferences (v) or it can be called a ranking. Preference calculation can use formula 2. The calculation of v in this study is:

$$V_{A11} = (R_{A11.1} * bobotC1) + (R_{A11.2} * bobotC2) = (0.830 * 0.5) + (0.793 * 0.5) = 0.812$$

$$V_{A12} = (R_{A12.1} * bobotC1) + (R_{A12.2} * bobotC2) = (0.798 * 0.5) + (0.802 * 0.5) = 0.800$$

The calculation of the preference of V is carried out up to V_{A65} , for thesame time as the pnya can be seen in Table 29.

Table 29. Ranking Results

V	Nilai Vi
VA11	0.812
VA12	0.800
VA13	0.810
VA14	0.816
VA21	0.841
VA22	0.856
VA23	0.826
VA24	0.824
VA25	0.783
VA31	0.848
VA32	0.800
VA33	0.835
VA34	1.000
VA41	0.875
VA42	0.821

V	Nilai Vi
VA43	0.823
VA51	0.846
VA52	0.851
VA61	0.798
VA62	0.792
VA63	0.885
VA64	0.793
VA65	0.782

In Table 17, the A14 value is the largest value of A1, the A22 value is the largest value of A2, the A34 value is the largest value of the A3 value, the A41 value is the largest value of A4, the A52 value is the largest value of the A5 value, and the A63 value is the largest value of A6.

From the overall calculation of SAW includes normalization and the ranking of preferential weights can be implemented in the system. For a view of the decision-making system can be seen in Figure 4. From view 4, admins can see the final decision results in Figure 5.

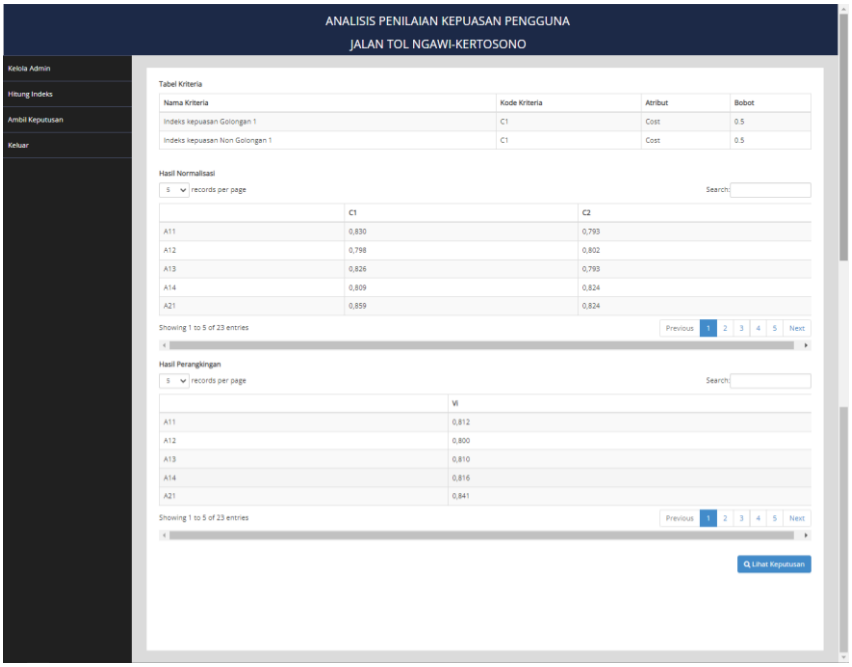

Figure 4. Make Up Your Mind

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Figure 5. See Decision

According to Figure 5, the type of transaction service that needs to be considered is the friendliness and courtesy of the officer when assisting with transactions at toll gates. For the type of traffic service that needs to be considered is the Speed of handling travel disturbances (strikes) by towing officers (< 30 minutes) and free of charge. For the type of construction services that need to be considered is Greening along the toll road provides comfort and beauty. For the type of information service that needs to be considered is toll road information services through telephone numbers that are easy to contact. For the type of PJR service that needs to be considered is the handling of traffic violations by toll road PJR officers according to your type of violation. As for the type of resting place service that needs to be considered is the type of restaurant in the rest area is varied, clean & comfortable. The point to note is that it must be immediately corrected and dealt with.

In filling out the satisfaction survey, toll users must fill out their biodata first. The data includes license plates, names, and vehicle types. In charging this type of vehicle that can be chosen as group 1 ornon-longan 1. Then toll users can save the filling and start filling out the survey bypressing the start filling button. Tollusers must fill out a survey on transaction services, traffic services, construction services, information services, services, PJR, and resting place services. On each of the types of stuffing has several indicators. Toll users can give a value between 1 to 6. Where the value of 1 is the lowest value, and the value of 6 is the highest value. After charging, toll users can save by pressing the save button.

4. CONCLUSION

Based on the discussion of the research in the previous chapter and referring to the research objectives, this study obtained the results of an assessment of the satisfaction of toll road users using the Simple Additive Weighting method. Satisfaction assessment can use a decision support system. According to the results of the assessment with a decision support system, some services that need to be improved immediately include:

1. The friendliness and courtesy of the officer when assisting with transactions at toll gates
2. Speed of handling travel disturbances (strikes) by Towing Officers (< 30 minutes) and free of charge
3. Greening along toll roads provides comfort and beauty
4. Toll Road information service through telephone number is easy to contact.
5. Handling of traffic violations by Toll Road PJR officers according to your type of violation
6. Types of restaurants in rest areas are varied, clean & comfortable

REFERENCES

[1] PP No 15, "PP No 15 Peraturan Pemerintah Tentang Jalan Tol," PP No 15, 2005.

[2] H. Iskandar, "Kajian Penyesuaian Golongan dan Tarif Tol dengan Mempertimbangkan Pengrusakan Perkerasan Jalan oleh Kendaraan Berat," vol. 26, no. 15, pp. 1–12, 2009.

[3] A. Khorista, E. Yulianto, and M. K. Mawardi, "(Survey Pada Pelanggan Fedex Express Surabaya)," J. Adm. Bisnis, vol. 25, no. 2, pp. 1–7, 2015, [Online]. Available: http://administrasibisnis.studentjournal.ub.ac.id/index.php/jab/article/view/1000.

[4] P. Utomo, S. D. Cahyono, Sutomo, and T. Tristono, "Selection of talented archery athletes using weighted product method," J. Phys. Conf. Ser., vol. 1211, no. 1, 2019, doi: 10.1088/1742-6596/1211/1/012037.

[5] Z. Hakim, A. R. Mariana, and N. Safitri, "Sistem Pendukung Keputusan Kepuasan Pelanggan di Minimarket dengan menggunakan Metode SAW," J. Sisfotek Glob., vol. 8, no. 2, pp. 112–116, 2018, [Online]. Available: http://stmikglobal.ac.id/journal/index.php/sisfotek/article/view/198.

[6] M. L. Ramdani and S. Nurmiati, "Sistem Penunjang Keputusan Kepuasan Konsumen Pada PT. Lotte Shopping Indonesia Bogor," Sainstech J. Penelit. dan Pengkaj. Sains dan Teknol., vol. 29, no. 2, pp. 43–49, 2019, doi: 10.37277/stch.v29i2.338.

[7] N. D. S. Bruno and M. A. I. Pakereng, "Sistem Pendukung Keputusan tentang Kepuasan Pengunjung Terhadap Pelayanan Di Perpustakaan

Daerah Salatiga Menggunakan Algoritma SAW (Simple Additive Weighting)," no. April, pp. 1–24, 2019.
[8] P. Utomo and D. N. Amadi, "Pemilihan Tanaman Pangan Untuk Ketahanan Pangan Masa Pandemi Dengan Simple Additive Weighting Di Kabupaten Madiun," Fountain Informatics J., vol. 5, no. 3, p. 12, 2020, doi: 10.21111/fij.v5i3.4924.
[9] Y. Utama, "Sistem Pendukung Keputusan Untuk Menentukan Prioritas Penanganan Perbaikan Jalan Menggunakan Metode Saw Berbasis Mobile Web," J. Sist. Inf., vol. 5, no. 1, pp. 566–579, 2013.
[10] I. Kurniawan and S. Assegaff, "Hari Dengen Metode Ahp (Analytical Hierarchy Process)," vol. 4, no. 3, pp. 313–325, 2019.
[11] H. Riajaya, K. Orlando, and P. L. Samputra, "Evaluasi Tingkat Kepuasan Masyarakat Terhadap Kebijakan Tarif Tol Becakayu," J. Perspekt. Ekon. Darussalam, vol. 5, no. 2, pp. 141–162, 2019, doi: 10.24815/jped.v5i2.13196.
[12] K. Rezananta Purnomo and B. Mulia Wibawa, "Analisis Tingkat Kepuasan Pengguna Jalan Tol di Wilayah Unit Jatim 02 Terhadap Layanan Satuan Patroli Jalan Raya Ditlantas Polda Jatim," J. Sains Dan Seni Its, vol. 9, no. 2, pp. 256–261, 2020.
[13] D. Nofriansyah and S. Defit, Multi Criteria Decision Making (MCDM) pada Sistem Pendukung Keputusan. Yogyakarta: Deepublish, 2020.