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MOTOR VEHICLE TEST QUEUE SYSTEM (Case Study in the Implementation Unit for Periodic Testing of Motorized Vehicles at the Gowa Regency Transportation Service)

Anggraeni Damayanti Regards

Hasanuddin University, Makassar, Indonesia.E-mail: anggraenidamayanti8@gmail.com

Abstract

This study aims to find out how the service system is implemented in the Motorized Vehicle Periodic Test Executor Unit of the Gowa Regency Transportation Service to test the speed of service and provide suggestions so that service accuracy occurs and service effectiveness is created. This study uses a quantitative approach, the data used is primary data, a sample of 100 samples with data analysis method using the formula Average hourly customer arrival rate (λ) Average hourly service level (μ) Number of service facilities (c) Level usability of the service system (P) Average number of customers in the system (L) Average number of customers in the queue (Lq) Average customer time in the system (W) Average time customers are in the queue (Wq) and qualitative research with a total of 25 informants. And the results of the study show that the average number of customers, the average customer arrival rate per hour (λ) is 10.66 customers per hour, the average customer served per hour (π) is 3.80 customers per hour, the average - the average the number of customers in the system (L) is 2.34 cars per hour, the average number of customers in the queue (Lq) is 1.64 cars per hour. The average time the customer is in the system (Ws) is 13.2 minutes. The average time the customer is in the queue (Wq) is 9 minutes. And the system usability level of 70.13% means that the customer's time to get service at the Motor Vehicle Periodic Test Executor Unit for the Gowa Regency Transportation Service has not gone well. The results of research interviews with 25 informants at the Motor Vehicle Periodic Test Executor Unit at the Gowa Regency Transportation Service stated that in the Tangible section the customer was not satisfied, the customer Reability was satisfied, the customer Responsiveness was satisfied, the Customer Assurance was not satisfied and the Customer Empathy was satisfied. So the level of customer satisfaction at the Motor Vehicle Periodic Test Executor Unit for the Gowa Regency Transportation Service has been running effectively but still needs improvement.

Keywords: *Motorized Vehicle Testing Queuing System, Motorized Vehicle Periodic Test Executor Unit*

A. INTRODUCTION

The Gowa District Department of Transportation is the government office responsible for transportation affairs in Gowa District, South Sulawesi Province.

The Gowa Regency Transportation Service provides parking services, passing permits, route permits, and testing of motorized vehicles.

In the service of testing motorized vehicles, the Gowa Regency Department of Transportation has a Motorized Vehicle Periodic Test Executor Unit (UPUBKB) whose job is to carry out periodic vehicle worthiness tests to maintain safety and comfort for passengers.

Table of Total Motorized Vehicle Testing Data at the Gowa Regency Transportation Service in 2022

Month	Amount				
	Mbl Passenger	buses	Car Goods Truck	Pickup Goods Car	Total
January		16	206	1517	1739
February		24	80	727	831
March	11	48	160	1627	1846
April		14	108	853	975
May		10	125	741	876
June	2	43	302	2048	2395
July		55	219	1430	1704
August		30	144	1159	1333
September		21	197	1271	1489
October		15	130	814	959
November	2	38	182	1129	1351
December	1	14	310	1725	2050

Source: Recapitulation of Motorized Vehicle Testing (2022) Gowa Regency Transportation Service

The number of motor vehicle tests at the Gowa Regency Transportation Service in 2022 will fluctuate monthly, with the lowest number in February and the highest number in June.

The Gowa Regency Department of Transportation needs to improve the effectiveness of services, facilities and infrastructure, as well as the attitude of employees towards customers, especially in testing motorized vehicles.

Routine and quality testing of motorized vehicles is important for maintaining safety, environmental sustainability and customer satisfaction. In its implementation, it is necessary to pay attention to indicators such as tangible (proof of agency capability), reliability (accuracy of officers), responsiveness (responsiveness), assurance (guarantee), and empathy (attention to customers).

Based on the background above and how important the queue system is to be implemented in increasing service effectiveness, the researcher is interested in conducting a study entitled: Motorized Vehicle Testing Queuing System (Case study in the Motorized Vehicle Periodic Test Executor Unit at the Gowa Regency Transportation Service).

FORMULATION OF THE PROBLEM

1. How long does it take for a customer to get service at the Motorized Vehicle Periodic Test Executor Unit at the Gowa Regency Transportation Service?

2. What is the level of customer satisfaction with services at the Executor Unit for Periodic Testing of Motorized Vehicles at the Gowa Regency Transportation Service?

RESEARCH PURPOSES

1. To analyze how long it takes for a customer to get service at the Motor Vehicle Periodic Test Executor Unit for the Gowa Regency Transportation Service.
2. To analyze the level of customer satisfaction on the service effectiveness of the Motorized Vehicle Periodic Test Executor Unit for the Department of Transportation, Gowa Regency.

B. METHODOLOGY

The research was conducted for 3 months, from February 2023 to April 2023, at the Gowa Regency Transportation Service Office, with a focus on the Motor Vehicle Periodic Test Executor Unit (UPUBKB).

TYPES AND SOURCES OF DATA

Type :

a. Qualitative data were obtained from the Gowa Regency Department of Transportation, especially from the Motorized Vehicle Periodic Test Executor Unit (UPUBKB), either through information provided orally or in writing.
b. Quantitative data were obtained from the Gowa Regency Department of Transportation, especially from the Motor Vehicle Periodic Test Executor Unit (UPUBKB), in the form of numbers that can be used for further analysis.

Data source:

a. Primary data was obtained directly from the Gowa Regency Transportation Service, especially from the Motorized Vehicle Periodic Test Executor Unit (UPUBKB), which requires further processing to adjust to the discussion in this study, for example, the number of customers queuing.
b. Secondary data is data collected by researchers from other sources that have been previously processed into written information relating to the object of research.

DATA COLLECTION TECHNIQUE

1. Observation
2. Interview
3. Documentation

POPULATION AND SAMPLE

Population: In the study, the population was an average of 100 customers who came to queue at the Motorized Vehicle Periodic Test Executor Unit (UPUBKB) of the Gowa Regency Transportation Service in one month during March 2023 and there were 25 people who became respondents in qualitative research interviews.

Sample: in this study were respondents or people who carried out tests at the Motorized Vehicle Periodic Test Executor Unit (UPUBKB) of the Gowa Regency

Transportation Service. The sample size can be found using the formula (Sugiarto and Siagian 2007, 70):

$$n = \frac{Z^2 P(Q)}{E^2}$$

Information :
n = Number of Samples
Z = Z table with a certain level of significance (1.96)
P = population proportion (0.5)
Q = (1-P)
E = Tolerable error expressed in % (10%) So that it can be obtained

$$n = \frac{1.96^2 \text{ x } 0.5(1-0.5)}{0.1^2}$$

$$n = \frac{0.9604}{0.01} = 96.04$$

Based on the calculations, it was found that the minimum number of samples required for this research to be valid was 96.04. Therefore, researchers took a sample of 100 customers. Determination of subjects or informants in this study using a purposive sampling method. Purposive sampling is a sampling technique for data sources based on certain considerations that suit research needs. In this study, there were 25 informants who were selected purposively.

C. ANALYSIS AND DISCUSSION

3.1. Description and Characteristics of the Research Object

GENERAL DESCRIPTION OF GOWA DISTRICT

Gowa Regency is divided into 18 sub-districts, with Somba Opu sub-district as the widest area and has a population of around 652,941 people. This district also has 169 villages and 762 sub-districts.

Geographically, Gowa Regency is located in the southern part of South Sulawesi Province, with coordinates 119.3773°- 120.0317° East Longitude and 508.2934° - 557.7305° North Latitude. Its area has an area of 1,883.33 km2, which is equivalent to 3.01% of the area of South Sulawesi Province. The Gowa Regency area consists of uplands and lowlands, each consisting of nine districts.

GOVERNMENT STATE

Gowa Regency was designated as a pilot level II region in government affairs in the field of transportation based on Government Regulation of the Republic of Indonesia Number 8 of 1995, which refers to the Transfer of Road Traffic and Transportation Affairs to Level II Regions in Ministerial Regulation Number 22 of 1990. As a consequence of this regulation , the Road Traffic and Transport Service (LLAJ) was formed. Then, based on Law Number 22 of 1999 and Regional Regulation of Gowa Regency Number 03 of 2001, LLAJ changed to the Gowa Regency Transportation Service by freezing the organization and working procedures of Gowa Regency offices.

In 2008, the Gowa Regency Transportation Service underwent a change to become the Gowa Regency Communication and Informatics Service based on the Gowa Regency Regional Regulation Number 3 of 2008 concerning government affairs which are the authority of the Gowa Regency Government, as well as Regional Regulation Number 7 of 2008 concerning the organization and work procedures of the service Gowa Regency area.

ORGANIZATIONAL STRUCTURE OF TRANSPORTATION DEPARTMENT OF GOWA DISTRICT

1. Head of the Gowa Regency Transportation Service
2. Secretary
    a. Head of General Affairs and Personnel Subdivision
    b. Head of Planning and Reporting Sub-Division
3. Head of Traffic Division
    a. Head of Motor Vehicle Testing Section
    b. Head of Operational Monitoring and Control Section
    c. Head of Safety Guidance Section
4. Head of Transport
    a. Head of the People's Transport Section
    b. Head of Special Transport and Goods Section
    c. Head of Transportation Business Development Section
5. Head of Facilities and Infrastructure Engineering Division
    a. Head of Traffic Engineering Management Section
    b. Head of Traffic Facility and Infrastructure Section
    c. Head of Terminal and Parking Section

The personnel data of the Gowa Regency Transportation Service are as follows:

1. Position
    a. Echelon II position= 1 person
    b. Echelon III position= 5 people
    c. Echelon IV position= 15 people
    d. staff = 92 people
2. class
    a. Group I= 1 person
    b. Group II= 31 people
    c. Group III= 75 people
    d. Group IV= 6 people

For more details regarding the condition of facilities and infrastructure, inventory and office stationery in the Gowa Regency Transportation Service office will be described in the following table:

Table of Suggestions and Infrastructure of the Gowa Regency Transportation Service

No	Office Stationery Inventory Facilities and Infrastructure	Amount
1	Work Building	2
2	Desk Room	9
3	Table	25
4	Chair	200
5	Cupboard/Archive	10
6	Computers/Laptops	13
7	Printers	7
8	Service vehicle	5
9	Bulletin board	2
10	Structure Board	1
11	Electricity	Available
12	Clean water	Available
	Amount	**274**

Source: Gowa Regency Transportation Service 2023

From the table presented, it can be seen that in the Gowa Regency Transportation Service office there is a shortage of facilities and infrastructure which can hinder the duties of employees in providing services to the community.

The table also shows that work buildings are divided into administrative buildings and service buildings, but there are several test equipment facilities and infrastructure in the Motor Vehicle Periodic Test Testing Unit:

Table of Test Equipment for Motorized Vehicle Periodic Test Executor Unit Gowa Regency Department of Transportation

No	Testing Tool	Amount	Condition
1	Exhaust Emission Test	2	Good Unused
2	Play Detector	1	Damaged
3	Head Light Tester	1	Good
4	Side Slip Testers	1	Good
5	Axle Load	1	Good
6	Brake Testers	1	Good
7	Sound Level	1	Good Unused

Source: Gowa Regency Transportation Service 2023

INFORMANT CHARACTERISTICS

1. CHARACTERISTICS OF INFORMANTS BASED ON GENDER

Table of Characteristics of Informants Based on Gender

Information	Frequency	Percentage %
Man	23	92%
Woman	2	8%
Amount	25	100%

Source: Processed from Interview data, April 2023

Based on the table above, the distribution of gender informants shows that 23 male informants, or 92%, and 2 female informants, or 8%.

2. CHARACTERISTICS OF INFORMANTS BASED ON AGE

Table of Informant Characteristics Based on Age

Information	Frequency	Percentage %
20-30	7	28%
31–40	9	36%
41 - 50	5	20%
51 - 60	4	16%
Amount	25	100%

Source: Processed from Interview data, April 2023

The table above shows the distribution of informants by age. Most of the informants are aged from 31-40, which is 9 informants or 36%; informants from 51-60, which is the least, with 4 informants or 16%; and the rest, from ages 20 to 30 are 7 informants or 28%, and from ages 41 to 50 are 5 informants or 20%.

3. CHARACTERISTICS OF INFORMANTS BASED ON LEVEL OF EDUCATION.

Table of Characteristics of Informants Based on Education Level

Information	Frequency	Percentage %
D3	2	8%
SENIOR HIGH SCHOOL	10	40%
JUNIOR HIGH SCHOOL	6	24%
SD	7	28%
Amount	25	100%

Based on the table above, the distribution of informants based on education level shows that 2 people with D3 education, or 8%, 10 people with high school education, or 40%, 6 people with junior high school education, or 24%, and 10 people with elementary school education 7 people, or 28% of the total informants.

4. CHARACTERISTICS BASED ON WORK

Table of Characteristics Based on Occupation

Information	Frequency	Percentage %
Employee	3	12%
staff	9	36%
Driver	13	52%
Amount	25	100%

Source: Processed from Interview data, April 2023

The table above shows the distribution of job information: three people, or 12%, work as employees, nine people, or 36%, and thirteen people, or 52%, work as drivers.

3.2. Research result

The service system carried out by the Motorized Vehicle Periodic Test Executor Unit (UPUBKB) of the Gowa Regency Transportation Service lasts for 5 working days a week. On Monday to Thursday, the service is carried out from 08.00 to 16.00 WITA with two time shifts, while on Friday, the service is

carried out from 08.00 to 11.30 WITA with a break of 2 hours and 30 minutes. In this study, the required data consists of quantitative and qualitative data. Quantitative data was collected by observing the customer arrival rate and customer service time data at the UPUBKB of the Gowa Regency Transportation Service. Meanwhile, qualitative data was collected through interviews regarding the level of customer satisfaction at the Gowa Regency Transportation Service UPUBKB.

Customer Arrival Rate Table
Motorized Vehicle Periodic Test Executor Unit of the Department of Transportation, Gowa Regency

NO	date	Number of Customers	Average Observation Hours	Calculation	Average Arrival Rate
1	01/03/2023	54	8	54 : 8 = 6.75	6.75 people per hour
2	02/03/2023	60	8	60 : 8 = 7.5	7.5 people per hour
3	03/03/2023	120	8	120 : 8 = 15	15 people per hour
4	06/03/2023	88	8	88 : 8 = 11	11 people per hour
5	07/03/2023	87	8	87 : 8 = 10,875	10,875 people per hour
6	08/03/2023	60	8	60 : 8 = 7.5	7.5 people per hour
7	09/03/2023	106	8	106 : 8 = 13.25	13.25 people per hour
8	10/03/2023	77	8	77 : 8 = 6.25	6.25 people per hour
9	13/03/2023	164	8	164 : 8 = 20.5	20.5 people per hour
10	14/03/2023	61	8	61 : 8 = 7.625	7,625 people per hour
11	15/03/2023	75	8	75 : 8 = 9.375	9,375 people per hour
12	16/03/2023	109	8	109 : 8 = 13.625	13,625 people per hour
13	17/03/2023	96	8	96 : 8 = 12	12 people per hour
14	20/03/2023	112	8	112 : 8 = 14	14 people per hour
15	21/03/2023	68	8	68 : 8 = 8.5	8.5 people per hour
16	24/03/2023	90	8	90 : 8 = 11.25	11.25 people per hour
17	27/03/2023	103	8	103 : 8 = 12.875	12,875 people per hour
18	28/03/2023	78	8	78 : 8 = 9.75	9.75 people per hour
19	29/03/2023	88	8	88 : 8 = 11	11 people per hour
20	30/03/2023	48	8	48 : 8 = 6	6 people per hour
21	31/03/2023	47	8	47 : 8 = 5.875	5,875 people per hour
	Amount	1791			

Source: data processed in 2023

From the table data above it can be seen that the average customer arrival rate is solved by the formula:

$$\lambda = \frac{\text{The number of customers who come}}{\text{Hours x days}}$$

$$= \frac{1791}{8 \times 21}$$

$$= 10.66 \text{ subscribers per hour}$$

Data on customer service time was obtained from observations of 100 customers from 1791 who came to the Executor Unit for Periodic Testing of Motorized Vehicles at the Gowa Regency Transportation Service by taking samples per day of 5 customers for 21 days of observation from 08:00 to 16:00

WITA in March 2023. In column number 1 there is a result of 6.75 people per hour meaning there are 6 customers queuing and 75 means the service is not used. Data about service time will be processed to find the average service time. Once the average service time is known, then the hourly service rate (μ) is sought.

Table of Customer Service Time Data
Motorized Vehicle Periodic Test Executor Unit of the Department of Transportation, Gowa Regency

No	Service Time	No	Service Time	No	Service Time	No	Service Time
1	15:37	26	15:36	51	14:12	76	17:18
2	4:35 p.m	27	4:56 p.m	52	15:45	77	15:22
3	15:20	28	17:42	53	15:11	78	14:17
4	15:23	29	4:59 p.m	54	16:28	79	16:10
5	16:13	30	14:14	55	16:09	80	2:49 p.m
6	15:43	31	15:25	56	15:05	81	4:32 p.m
7	14:11	32	17:01	57	14:41	82	15:45
8	2:25 p.m	33	14:06	58	17:26	83	5:50 p.m
9	17:14	34	15:25	59	4:29 p.m	84	16:14
10	15:50	35	16:43	60	15:43	85	2:59 p.m
11	14:24	36	18:24	61	4:56 p.m	86	16:22
12	15:57	37	14:16	62	15:42	87	15:35
13	3:30 p.m	38	15:24	63	14:22	88	2:20 p.m
14	4:37 p.m	39	14:05	64	15:18	89	15:33
15	15:54	40	15:20	65	2:45 p.m	90	15:29
16	5:55 p.m	41	16:11	66	2:25 p.m	91	17:05
17	16:52	42	15:26	67	18:48	92	4:36 p.m
18	14:10	43	13:24	68	15:36	93	15:29
19	15:50	44	14:28	69	15:49	94	15:41
20	15:29	45	15:34	70	14:57	95	15:23
21	4:36 p.m	46	5:36 p.m	71	15:21	96	15:32
22	15:44	47	13:51	72	4:39 p.m	97	16:17
23	16:17	48	15:44	73	18:47	98	15:55
24	15:37	49	15:22	74	15:47	99	15:45
25	15:40	50	16:55	75	14:21	100	17:08
							1579,18

Source: data processed in 2023

The results of observations of 100 customers note that the service time is 1579.18 minutes.

The average service time is calculated as follows:

$$\frac{1579,18}{100} = 15.7918$$

Then the average service time per unit is converted to the service level per hour

$$\mu = \frac{1 \quad (60)}{15.7918}$$

= 3.80 Customers per hour

So the average service level is 3.80 customers per hour

The data analysis used is:

The data analysis method used in the Motor Vehicle Periodic Test Executor Unit for the Gowa Regency Transportation Service based on previous calculations can be seen:

λ = The average number of customers is 10.66 customers per hour

μ = Average customer service level of 3.80 customers per hour

c = Number of customer facilities as many as 4 service facilities

There are several formulas used, namely:

A. The average number of customers in the system

$$L = \frac{\lambda}{\mu c - \lambda}$$

$$L = \frac{10.66}{3.80\,(4) - 10.66}$$

$$= \frac{10.66}{4.54}$$

$$= 2.34$$

The figure indicates that employees can expect 2.34≈2 cars that are in the system.

B. The average number of customers in the queue

$$lq = \frac{\lambda^2}{\mu c(\mu c - \lambda)}$$

$$= \frac{10{,}662}{3.80(4)[3.80(4)-10.66]}$$

$$= \frac{113.6356}{69.00}$$

$$= 1.64$$

This figure shows that there are 1.64 cars waiting to be served in the queue≈1 Vehicle

C. The average customer is in the system

$$Ws = \frac{1}{\mu c - \lambda}$$

$$= \frac{1}{3.80(4) - 10.66}$$

$$= \frac{1}{4.54}$$

= 0.22 hours or 13.2 minutes

This figure shows that the average time a vehicle waits in the system is 13.2 minutes

D. The average time a customer is in the queue

$$Wq = \frac{\lambda}{\mu c(\mu c - \lambda)}$$

$$= \frac{10.66}{3.80(4)[3.80(4)-10.66]}$$

$$= \frac{10.66}{69.00}$$

$= 0.15$ hours or 9 minutes

This figure shows that the average time a vehicle waits in a queue is 9 minutes

E. System Usability Level

$$P = \frac{\lambda}{\mu c}$$

$$= \frac{10.66}{15,2}$$

$= 0.7013$ or 70.13%

This figure shows that employees will be busy servicing vehicles 70.13% of the time. While 29.87% of the time (1 – P) which is often called idle time will be used by employees to rest, etc.

3.3. Discussion

Arrival Rate and Customer Service: Based on the analysis of the queuing system, it was found that the average hourly customer arrival rate (λ) was 10.66 customers per hour, while the average customer served per hour (π) was 3.80 customers per O'clock. This shows that the number of customers who come exceeds the number of customers served, so that a queue is formed. In addition, the average time customers are in the queue (Wq) is 9 minutes, and the average time customers are in the system (Ws) is 13.2 minutes. This information is important for evaluating the effectiveness of the unit's services.

Queuing Model Used: The Single Channel—Multi Phase Model, which has two or more service facilities working sequentially in certain phases, is the model most suitable for the Executor Unit for Motorized Vehicle Periodic Tests at the Gowa Regency Transportation Service. This model has one queue line to enter the service system. Having the right queuing model can help in creating an effective service flow.

Customer Satisfaction Level: Data collected from interviews conducted with customers at the Executor Unit for Periodic Testing of Motorized Vehicles at the Gowa Regency Department of Transportation indicate a high level of customer satisfaction. Research shows that customers are satisfied with services because of their reliability, responsiveness, and empathy. But tangible (physical impression) and assurance (guarantee) still need to be improved. Using this data, you can improve service quality and customer satisfaction by prioritizing aspects that still need improvement.

D. CONCLUSION

1. The average number of customers and the arrival rate of customers per hour is 10.66 customers per hour (λ), the average customer served per hour is 3.80 customers per hour (π), the average number of customers in the system is 2 .34 cars per hour (L), the average number of customers in the queue is 1.64 cars per

hour (Lq), the average time the customer is in the system is 13.2 minutes (Ws), the average time the customer is in the queue is 9 minutes (Wq), and the system usability rate is 70.13%. This shows that the customer's time to get service at the Motorized Vehicle Periodic Test Executor Unit of the Gowa Regency Transportation Service has not gone well.

2. The results of interviews with customers show that in the tangible section, the customer is not satisfied, the customer's reliability is satisfied, the customer's responsiveness is satisfied, the customer's assurance is not satisfied, and the customer's empathy is satisfied. The level of customer satisfaction at the Motor Vehicle Periodic Test Executor Unit for the Gowa Regency Transportation Service has been running effectively, but still needs improvement, especially on the tangible and assurance aspects.

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