UJM 7(2) 2018
UNNES Journal of Mathematics
http://journal.unnes.ac.id/sju/index.php/ujm

OPTIMIZATION OF SERIES QUEUE SYSTEM AT SAMSAT (ONE ROOF SYSTEM) SERVICE FACILITY BASED ON ASPIRATION LEVEL

Niken Yulia Astuti✉, Nur Karomah Dwidayati, Sunarmi

Department of Mathematics, FMIPA, *Semarang State University*, Indonesia
3rd floor D7 building, Sekaran Gunungpati, Semarang 50229

Info Artikel

Artikel history:
Received July 2018
Accepted August 2018
Available online November 2018

Keywords:
Queuing System, Single Channel Multiple Phase, [G/G/1]:[GD/∞/∞] queue model, SAMSAT.

Abstrak

Antrian dapat ditemui pada beberapa fasilitas pelayanan umum misalnya di Kantor Sistem Administrasi Manunggal Satu Atap (SAMSAT). Tujuan dari penelitian ini untuk mengetahui model sistem antrian yang saat ini diterapkan di Kantor SAMSAT Kota Tegal untuk mengetahui ukuran keefektifan proses pelayanan wajib pajak, dan memberikan sistem antrian yang optimal berdasarkan tingkat aspirasi. Dari hasil penelitian diperoleh bahwa pada SAMSAT Kota Tegal mengikuti model sistem antrian *Single Channel Multiple Phase* (antrian tandem atau seri). Rincian model antrian pada loket pendaftaran, pembayaran, dan penyerahan STNK adalah [G/G/1]:[GD/∞/∞]. Ini berarti sistem antrian mengikuti pola kedatangan yang berdistribusi General sedangkan waktu pelayanan berdistribusi General dengan jumlah pelayan meliputi 1 petugas di tiap loketnya. Hasil efektivitas dari sistem antrian di Loket SAMSAT Kota Tegal adalah hari Senin, 19 Maret 2018 dengan L_q = 5,0993, L_s = 5,7451, W_q = 12,6078, W_s = 14,2045, dan W = 35,42%. %. Pada hari Selasa, 20 Maret 2018 dengan L_q = 4,3054, L_s = 4,8791, W_q = 12,4754, W_s = 14,1375, dan W = 42,64%. Pada hari Rabu, 21 Maret 2018 dengan L_q = 4,1846, L_s = 4,7469, W_q = 12,4156, W_s = 14,0839, dan W = 43,77%. Pada hari Kamis, 22 Maret 2018 dengan L_q = 4,3002, L_s = 4,8947, W_q = 11,6106, W_s = 13,2158, dan W = 40,55%. Waktu menunggu yang diinginkan pengunjung dan pihak SAMSAT tidak lebih dari 20 menit dan waktu menganggur petugas yang diperbolehkan oleh SAMSAT Kota Tegal adalah 20% maka banyaknya petugas ideal pada tiap loketnya yaitu 1 orang petugas.

Abstract

Queues can be found in some public service facilities such as in SAMSAT Office (One Roof System). The purpose of this research is to know the model of queuing system currently applied in SAMSAT of Tegal City to know the effectiveness of taxpayer service process, and provide an optimal queue system based on the level of aspiration. The result showed that the SAMSAT of Tegal city follow the model of a queuing system Single Channel Multiple Phase (queue tandem or series). The details of the queuing model at registration counters, payments, and checkers of STNK delivery are [G/G/1]:[GD/∞/∞]. This means the queuing system follows the General distributed arrival pattern while the General Distributed service time with the number of waiters includes 1 officer at each counter. The effectiveness of queuing system in SAMSAT of Tegal City is on Sunday, 19 March 2018 with L_q = 5,0993, L_s = 5,7451, W_q = 12,6078, W_s = 14,2045, dan W = 35,42%. On Tuesday, 20 March 2018 with L_q = 4,3054, L_s = 4,8791, W_q = 12,4754, W_s = 14,1375, dan W = 42,64%. On Wednesday, 21 March 2018 with L_q = 4,1846, L_s = 4,7469, W_q = 12,4156, W_s = 14,0839, dan W = 43,77%. And Thursday, 22 March 2018 with L_q = 4,3002, L_s = 4,8947, W_q = 11,6106, W_s = 13,2158, dan W = 40,55% Waiting time desired visitors and parties SAMSAT no more than 20 minutes and idle time officers allowed by SAMSAT of Tegal City is 20% then the number of ideal officers at each counter that is 1 officer.

How to Cite

Astuti, N. Y., Dwidayati, N. K., & Sunarmi. (2018). Optimalisasi Sistem Antrian Seri pada Sarana Pelayanan SAMSAT (Sistem Administrasi Manunggal Satu Atap) Berdasarkan Tingkat Aspirasi. *UNNES Journal of Mathematics* 7(2) : 206-215.

✉Corresponding author:
E-mail: nikenyuliaastuti4111414013@gmail.com

p – ISSN 2252-6943
e – ISSN 2460-5859

INTRODUCTION

In everyday life, queuing, or waiting line is very common. Queuing is sometimes done whenever you are waiting, for example to buy a movie ticket, pay tolls, take or deposit money in the bank, and others. Queues can also occur in goods, such as queues of raw materials that will be processed to be a particular product, export commodities to be loaded onto ships, or data to be processed by computers, and so forth.

This phenomenon occurs because there are many customers who want to be served while the number of waiters is very limited This phenomenon is also a direct result of randomness in the operation of service facilities in general, customer arrival and service time is not known before, because if known then the operation of such facilities can be scheduled so that will provide maximum service and efficient (Nurhayati, 2014: 2).

According to Sharma *et al*. (2013: 1), generally everyone has experienced the queue incident in his life. Therefore it can be said that the queue has become part of one's life. Even in the United States today it has been estimated that Americans spend about 37,000,000,000 hours per year waiting in queues.

The main actors in a queuing situation are the customers and the server. In the queuing model, the interaction between the customer and the waiter is in relation to the period of time that the customer acquires to complete a service. Thus, from the point of view of arriving customer arrivals is the time interval separating successive arrivals. Also in service, which is taken into account is the time per customer service (Ikrimah, 2012: 27).

Queues can be found in some public service facilities where people or goods will experience the process of queuing from arrival, entering the queue, waiting, until the service process takes place. In addition to the above mentioned phenomena, the queue phenomenon can be author encountered on the Public Service.

Service sections generally consist of booths that are minimally operated by an employee assigned to serve a community need. Service counter is not necessarily only a counter and clerk but some other factors come into play in it such as seating capacity, employee performance, place arrangement, service duration, and others. These factors are of concern to the public in assessing the quality of these bodies and need to be considered in conducting the development of public services, especially on the queue system counter service.

In Indonesia, some regions have used online SAMSAT facilities and services such as E-Samsat for East Java, SAMSAT Drive Thru for DKI Jakarta, and Integrated SAMSAT for West Java. With the existence of the SAMSAT Online has been able to facilitate the payment of motor vehicle taxes because it can pay motor vehicle tax at the office with any SAMSAT for 1 province. However, there are still many shortcomings, among others, some areas that already provide facilities and services online SAMSAT still require taxpayers come to the nearest office of SAMSAT. n addition, other shortcomings also occur in online services because it is still limited only to annual tax payments only and not all regions provide online SAMSAT facility.

One of them is the SAMSAT Office of Tegal City located at Jalan Kapten Sudibyo No. 152, Tegal City, Central Java 52416, Indonesia. SAMSAT Tegal City is an integrated system of cooperation between Polri, Dispenda, and PT Jasa Raharja in service to issue Vehicle Registration Number (STNK).

Based on a survey conducted by researchers at the service of motor vehicle tax validation for SAMSAT Tegal City itself has been using the services and facilities of SAMSAT Online but still require taxpayers to come to the SAMSAT Office if they want to pay motor vehicle tax and have to pass each stage. Thus, resulting in queue phenomenon occurs almost every day in SAMSAT Tegal City. The interesting thing for researchers is the queue system that occurs in this SAMSAT follows the tandem queuing system or series. The queue that the customer arrives comes from one row and is served by several service providers (*servants*) in series is called the tandem queuing system or series.

Queues with series models are described through a particular distribution indicating the arrival of the customer at a place using the queuing system. Customers must go through all stations in order to get the service thoroughly (Kakiay, 2004: 189).

The queue discipline used in SAMSAT office of Tegal City is *First In First Out* (FIFO), where in this system customers who come first will get a turn of service first. Generally, a umber of literature sourceson queuing systems raises some objections to the use of the classical *First Come First Served* (FCFS) queuing discipline in systems with heterogeneous structures (Krishnamoorthy, 1962; Alexander, Marcus, & Cristobal, 2014).

Implement this system using the queue line (*waiting line*). Customers who come not directly get the service, but the customer must

enter the queue waiting line that extends backward in accordance with the order of arrival then wait until finally get the service. (Ahse, 2014: 4).

Therefore, in order to avoid losses on SAMSAT office and the taxpayer is required analysis of the queuing system in the office. There are two methods in determining analysis on queuing system that is by using cost model and aspiration-level model (Taha, 2007: 597). Both models review the analysis of the queuing system of two factors: cost model from cost side while *aspiration-level model* from time side. The problem with the SAMSAT Office of Tegal City is classified on the *aspiration-level model* from the time side. The problem occurs not because the SAMSAT Office of Tegal City loses the taxpayer but the taxpayer feels time wasted because of the long queue and about the service time is too long. The image of an institution would be bad if the service is less satisfactory for taxpayers where the main factor is the time of payment that is too long into the problem.

Based on the background of the problem, then conducted a systematic study to analyze the queue system at the service counter of SAMSAT Office of Tegal City based on the *aspiration level* of the time side in order to provide optimal service. The queuing situation occurring in this SAMSAT can be described with the queuing system scheme as presented in Figure 1.

Therefore, based on the above description shows that the model of queue system at the service counter of SAMSAT Office of Tegal City is a model of tandem or series queuing system. This model illustrates that the taxpayer who wants to complete the tax payment procedure must pass through three different phases. In addition, the queue discipline used is First In First Out (FIFO), where in this system customers who come first will get a turn of service first.

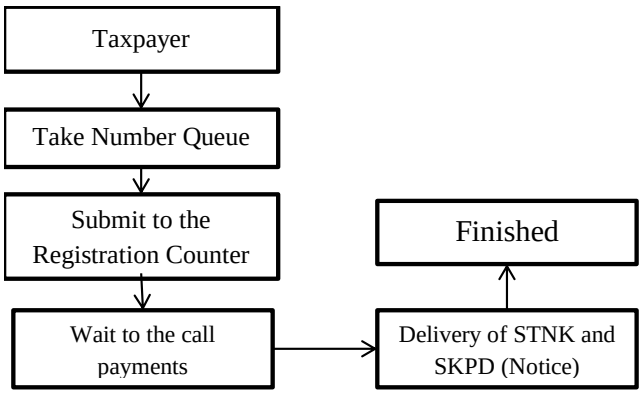

Figure 1. System Scheme Queue Taxpayer Services SAMSAT Office of Tegal City

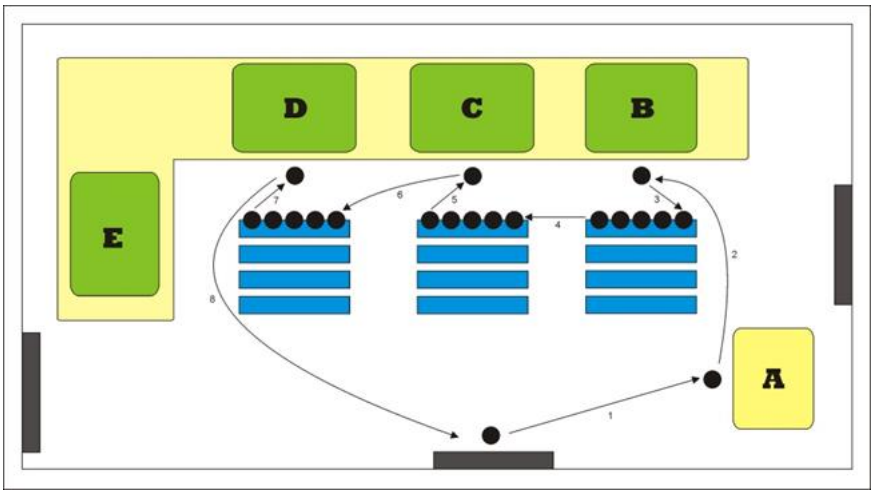

Figure 2. Plan of Vehicle Payment Tax Payment System at SAMSAT of Tegal City

METHOD

This observation was conducted at Administration System Single One Roof (SAMSAT) of Tegal City which is located at Kapten Sudibyo Street No. 152, Tegal City, Central Java 52416, Indonesia. Time Research was conducted for four days on Monday, March 19, 2018 until Thursday, March 22, 2018 starting at 08:00 to 11:00 pm. SAMSAT research of Tegal City as research location is based on several things. The first is located in the city of Tegal is strategic enough to facilitate researchers in conducting research. The second is SAMSAT Kota Tegal has a fairly complex queue system seen from the crowded queues and queue grooves that have several stages.

Based on the result of interviews that have been done then obtained at queue system at SAMSAT Office of Tegal City is divided into two parts, which is part A which handles the annual vehicle tax payment and change vehicle registration, while the B part handles the mutation, new registration, STNK is lost, change the address, change the police number and behind the name. For the tax payment queue system scheme can be seen in Figure 2.

Every taxpayer must pass through all these counters to complete his needs. In this study observed are the counters that serve the annual vehicle tax as in figure 2.

SAMSAT of Tegal City has a future target to improve the quality of its services. To complete the annual vehicle registration certificate, SAMSAT of Tegal City has a target of 15 minutes processing time where the previous standard time is 20 minutes. Therefore, decision-making is based on the annual service time of the annual motor vehicle taxpayer for less than 15 minutes. This then becomes the determinant factor of effectiveness in queue system SAMSAT of Tegal City.

The data used in this research is primary data, that is data taken directly through observation process (observation).

The limit of the problem on this observation is (1) This observation was conducted at SAMSAT office of Tegal City; (2) do not discuss costs; (3) queue observations occur during busy times; (4) there is no refusal and cancellation of taxpayer arrival. After collecting the data, the data is processed through several stages as in Figure 3, namely:

1. Determine the probability distribution of the data obtained
   The initial step that must be done is to determine the hypotheses to be used in this study. The hypothesis to be used is:
   H_0 : Samples taken from the population of certain distribution.
   H_1 : Samples taken from the population distribution is not certain.
   With a significance level of $\alpha = 5\%$.
2. To test the data distribution with the Kolmogorov-Smirnov test in SPSS
   a) Hypothesis for Poisson distribution test and Exponential distribution test
      In this study, the arrival of the taxpayer assumed Poisson distributed.
      H_0 = the arrival of the taxpayer distributed Poisson,
      H_1 = the arrival of the taxpayer is not Poisson distributed.
      Hypothesis for taxpayer service time pattern in this research is as follows:
      H_0 = pattern taxpayer service time distribution Exponential,
      H_1 = pattern taxpayer service time is not distributed Exponential.
   b) Testing Criteria
      By using *Kolmogov Smirnov Test* if Sig on the Test $Table\ Distribution\ Poisson < 0{,}05$ then H_0 is rejected. If Sig on the Test $Table\ Distribution\ Poisson > 0{,}05$ then H_0 is accepted.
   c) Open SPSS program
   d) Enter the arrival frequency data at each counter.
   e) For *Kolmogorov Smirnov* test, on the main menu select the *Analyze*, *Nonparametric Test*, *Legalicy Dialogs*, select *1-Sample K-S*.
   f) Then enter the data on the box Test Variable List, the check Poisson Distribution Test
   g) Click Ok.
   h) In the output image above it appears that $Asymp.Sig\ (p - value)$ is 0,000 which is less than $\alpha = 0.05$. Therefore, the data is not Poisson distributed. Likewise to find out whether the data is exponentially distributed or not.
3. Calculate taxpayer arrival rate and service level (server)
   a) Taxpayer arrival rate
      $$\lambda = \frac{\text{Number of Taxpayers}}{\text{Total Times between Arrivals}} \ldots\ldots (1)$$
   b) Taxpayer service level
      $$\mu = \frac{\text{Number of Taxpayers}}{\text{Total Service Time}} \ldots\ldots\ldots\ldots (2)$$
4. Calculates the effectiveness of the queuing system at SAMSAT office of Te gal City

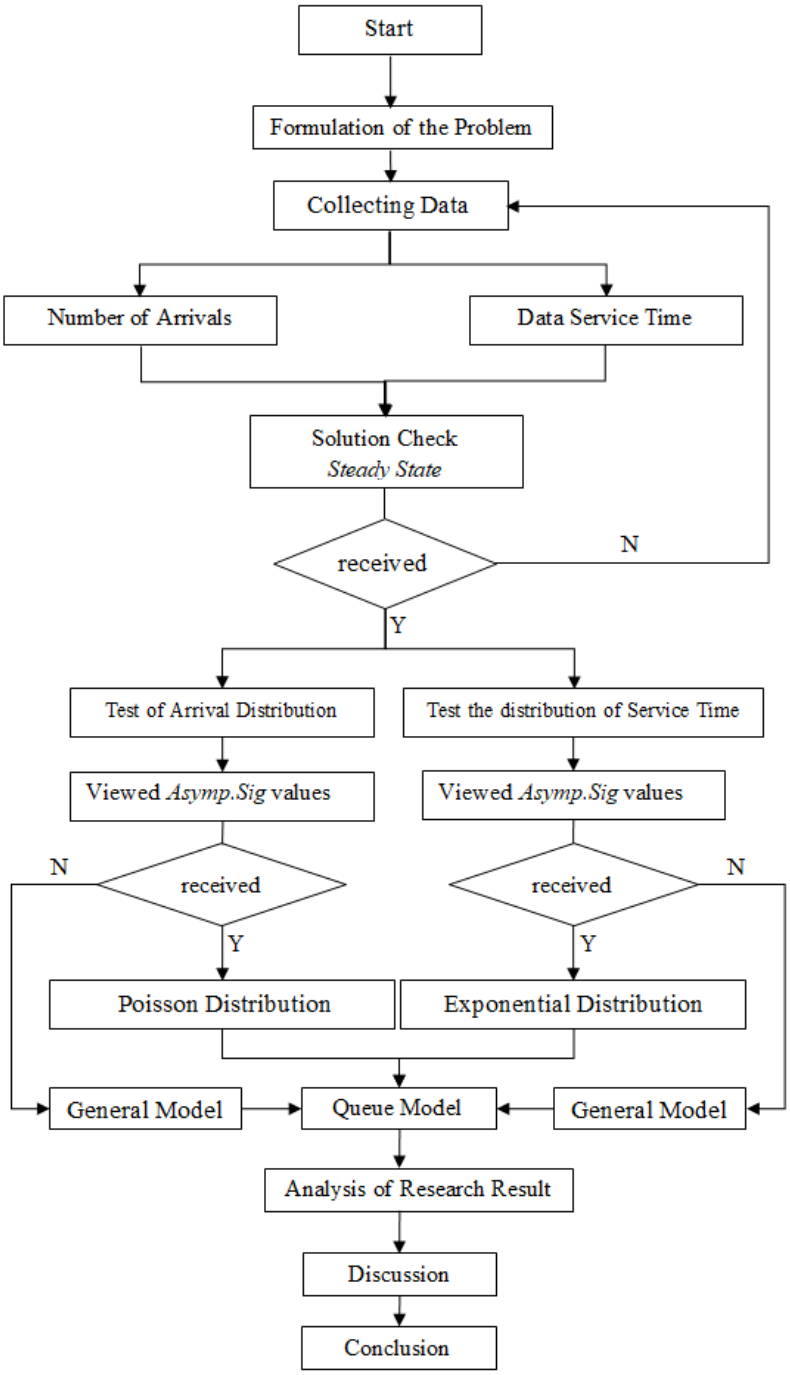

Figure 3. Research Plot Diagram

a) Taxpayer arrival rate

$\rho = \frac{\lambda}{\mu}$ ..... (3)

is known:

λ : The average rate of taxpayer arrivals (many taxpayer arrivals per unit time)

μ : The average rate taxpayer services (many taxpayers are served per unit of time) (Tarliah & Dimyati, 1987: 305).

The steady state state can be satisfied if $\rho < 1$ where the arrival rate is less than the service rate which means that $\lambda < \mu$. Where as if $\rho > 1$ then the arrival occurs with a speed that is faster than that can be accommodated by the waiter, the same situation applies if $\rho = 1$ then there will be no queue. In other words, steady state is not achieved (Dwidayati, 2005).

b) Opportunities are not serving taxpayers
$P_0 = 1 - \rho$ .....(4)

c) The average number of taxpayers who are expected to wait in the queue
$L_q = \frac{\rho^2}{1-\rho} . \frac{\mu^2 v(t) + v(t')\lambda^2}{2}$.....(5)

d) The average number of taxpayers who are expected to wait in the system
$L_s = L_q + \rho$.....(6)

e) The average time spent waiting for the taxpayer in the queue
$W_q = \frac{L_q}{\lambda}$.....(7)

f) The average time spent waiting for the taxpayer in the system
$W_s = W_q + \frac{1}{\mu}$.....(8)
(Marissa dan Sugito, 2009: 113)

RESULTS AND DISCUSSION

The joint office of SAMSAT of Tegal City consists of fast SAMSAT and SAMSAT Mains. The study was conducted on SAMSAT Parent service which includes annual and fifth annual vehicle tax service, new registration, login mutation, and change of police number or rename.

The queue system that occurs at the SAMSAT office of Tegal City follows the queuing system using *Single Channel Multiple Phase* (tandem or series queue) queue system model. This model queuing system model illustrates that the taxpayer who wants to complete the tax payment procedure must pass through three different phases. In addition, the queue discipline used is *First In First Out* (FIFO), where in this system taxpayers who come first will get a turn of service first. The queue situation that happened at SAMSAT Office of Tegal City can be described with queuing system as in Figure 4.

Figure 4. Queuing System Scheme in SAMSAT Office of Tegal City

Analysis of Taxpayer Arrival

Data taken from the SAMSAT Office of Tegal City is a lot of taxpayer arrivals at registration counters, many taxpayer departures at checkout or checkout counters, and counters every second. To apply the queuing theory to the data already taken, first test whether the data is the number of arrivals and departures distributed Poisson or not.

This test is done with the help of SPSS program by performing several stages as described. By using the Kolmogorov-Smirnov test then the arrival of the taxpayer for the day Monday, March 19, 2018 until the day Thursday, March 22, 2018 on the registration counter, counter Payment and Delivery of vehicle registration counter obtained $Asymp.Sig\ (p - value)$ of 0.000. This results in H_0 being rejected due to the value of $Asymp.Sig\ (p - value) = 0{,}000 < \alpha = 0{,}05$. Then it can be concluded that the taxpayer arrival at each counter is not Poisson distributed.

After knowing the probability distribution on the data that has been obtained then it can be calculated the average arrival rate of the taxpayer for each counters for four days. To recapitulate the average rate of arrival of taxpayers $\left(\frac{1}{\lambda}\right)$ can be seen in Table 1.

Obtained time between the arrival of the smallest taxpayer is on Monday, March 19, 2018. It is because the number of taxpayers who come, so the distance between taxpayers who come on that day not too far around 2.4244 minutes per taxpayer. For the largest inter arrival time on Tuesday, March 20, 2018 which is about 3.1118 minutes, due to the number of taxpayers who come less than the other day. For the distribution of data on each counter by *Kolmogorov Smirnov* test is not distributed Poisson because the value of $Asymptotic\ significance\ (2 - tailed)$ or $p - value$ of $0{,}000 < \alpha = 0{,}05$.

Analysis of Taxpayer Service Time

Obtained by observation of queue system at Samsat Office of Tegal City obtained time t service, that is time needed to serve one taxpayer. The average service rate of the taxpayer (μ) is the average number of visitors that can be serviced per time unit. First test whether the data is exponential or not distributed.

This test is done with the help of SPSS program by performing several stages as described. By using the Kolmogorov-Smirnov test the service time of the taxpayer for the day Monday, March 19, 2018 until the day Thursday, March 22, 2018 on the registration counter, counter Payment and Delivery of vehicle registration counter obtained $Asymp.Sig\ (p - value)$ of 0.000. This results in H_0 being rejected due to the value of $Asymp.Sig\ (p - value) = 0{,}000 < \alpha = 0{,}05$. Then it can be concluded that the service time taxpayer at each counter did not distributed Exponential.

Table 1. Recapitulation of $\frac{1}{\lambda}$ and $\frac{1}{\mu}$ calculations

Day/Date	Counter	$\frac{1}{\lambda}$ (time/person)	$\frac{1}{\mu}$ (time/person)
Monday/ March 19, 2018	Registration	2,4244	0,2173
Time: 08.00-11.00	Payment	2,4724	1,5967
	Submission of STNK	2,712	0,2669
Tuesday/March 20, 2018	Registration	3,1118	0,675
Time: 08.00-11.00	Payment	2,8976	1,6621
	Submission of STNK	3,5091	0,3387
Wednesday/March 21, 2018	Registration	2,7992	0,188
Time: 08.00-11.00	Payment	2,9669	1,6683
	Submission of STNK	3,0172	0,2954
Thursday/March 22, 2018	Registration	2,5806	0,2142
Time: 08.00-11.00	Payment	2,7	1,6052
	Submission of STNK	2,6287	0,2582

After knowing probability distribution on data that have been obtained then can be calculated service rate average taxpayer for each counters for four days. To recapitulate the average service rate of taxpayers $\left(\frac{1}{\mu}\right)$ can be seen in Table 1.

Obtained average service time of the smallest taxpayer is on Monday, March 19, 2018. It is because taxpayers who come more, so the time taxpayers who served on the day that fast is about 1.5967 minutes per taxpayer. For the average service time is the most on Wednesday, March 21, 2018 which is about 1.6683 minutes per taxpayer, due to the number of taxpayers who come less than the other day. Counter service facilities must adjust the speed of service with the number of taxpayer arrivals.

Determining the Queue Model at SAMSAT Office of Tegal City

In queuing models, customer arrivals and service times are summarized in a probability distribution commonly referred to as arrival distribution and service time distribution. Generally arrivals are assumed to be Poisson distributed while service time is assumed to be Exponential distribution, if both assumptions are not met then the queuing model is assumed to be general distributed.

In this research, queue that happened at SAMSAT Office of Tegal City is assumed to use queuing model $[G/G/1]:[GD/\infty/\infty]$. From the results of research conducted the arrival pattern is not Poisson distributed while the service time is not distributed Exponential

At SAMSAT Kota Tegal office for registration counters, payment counters and tax return counters are placed one waiter with first-come service arrangements will be served first. The number of taxpayers in the system and in the queue as well as the source of taxpayer arrival is unlimited. So, the queue system at SAMSAT office of Tegal City follows the queuing model $[G/G/1]:[GD/\infty/\infty]$.

Determining the Effectiveness of Taxpayer Service Process

The effectiveness of the service process is determined by calculating the average number of taxpayers in the system and the queue, calculating the average waiting time taxpayers in the system and queue, as well as calculate the probability of officers not being serving the taxpayer.

The calculation of the effectiveness of the motor vehicle tax payment queuing system in SAMSAT of Tegal City is done by entering the data obtained into Equation (1) to calculate the usefulness level of the service facility, Equation (3) to calculate the steady state of performance, and Equation (4) no taxpayers are coming.. Furthermore, to calculate the average number of taxpayers in the queue used Equation (5), the average number of taxpayers in the system (6), the average waiting time of the taxpayer in the queue (7), and the average waiting time of the taxpayer in the system is used Equation (8). The calculation result of effectiveness of queue system of annual vehicle tax payment in Tegal City is written in Table 2.

Table 2. Results Calculation Process Effectiveness Services

Day/Date	Counter	ρ	L_q	L_s	W_q	W_s	P_0
Monday/ March 19, 2018	Registration	0,0896	0,0262	0,1158	0,0634	0,2807	0,9104
Time: 08.00-11.00	Payment	0,6458	5,0993	5,7451	12,6078	14,2045	0,3542
	Submission of STNK	0,0984	0,0399	0,1383	0,1082	0,3751	0,9016
Tuesday/March 20, 2018	Registration	0,2169	0,3046	0,5215	0,9479	1,6229	0,7831
Time: 08.00-11.00	Payment	0,5736	4,3054	4,8791	12,4754	14,1375	0,4264
	Submission of STNK	0,0965	0,0641	0,1606	0,2249	0,5636	0,9035
Wednesday/March 21, 2018	Registration	0,0672	0,019	0,0862	0,0533	0,2412	0,9328
Time: 08.00-11.00	Payment	0,5623	4,1846	4,7469	12,4156	14,0839	0,4377
	Submission of STNK	0,0979	0,0488	0,1467	0,1473	0,4426	0,9021
Thursday/March 22, 2018	Registration	0,083	0,0252	0,1082	0,065	0,2792	0,9170
Time: 08.00-11.00	Payment	0,5945	4,3002	4,8947	11,6106	13,2158	0,4055
	Submission of STNK	0,0982	0,0373	0,1355	0,0981	0,3563	0,9018

In the observations made during the four days at the SAMSAT Office, especially on motor vehicle tax payments, it was observed that busy times occurred at each counter consisting of registration counters, payment counters and ticketing counters on Monday, March 19, 2018 at 09.00 WIB. This is due to the amount of taxpayers that come in excess of other days. It can be seen in Table 2 that for the number of taxpayers waiting in the queue and in the system has the longest queue over the other day.

From the results of research on the counter payment, for the average time spent in taxpayers in the queue of 12.6078 minutes for each taxpayer and for the average time spent in the system of 14.2045 minutes for each taxpayer. While at the registration counter registration counterthe taxpayer only collects the files for tax payment then go directly to the counter payment to wait for the payment call and at the counter of the taxpayer submission of taxpayer only take new renewed vehicle. Therefore, in Table 2 it can be seen that the queue occurring at the registration counter and the registration counter of the vehicle registration that happened not too long on each day. To complete the ratification of the annual vehicle registration motor vehicle, SAMSAT of Tegal City has a target processing time of 15 minutes in which time the previous standard of 20 minutes. Therefore, decision-making is based on the annual service time of the annual motor vehicle taxpayer for less than 15 minutes. This then becomes the determinant factor of effectiveness on queuing system at SAMSAT of Tegal City.

Judging from the results of the research analysis, to complete the payment of annual motor vehicle tax of SAMSAT Office of Tegal City has reached the specified target because in Table 2 it can be seen that the service time of the annual motor vehicle tax is less than 15 minutes.

Determine the ideal number of officers

The excessive number of waiters can reduce the taxpayer buildup in the queue on the system but can also result in more idle time than expected so that many bankers will not do the job or do nothing.

From the above analysis results obtained the smallest officer opportunity that does not serve the taxpayer at the registration counter is visible on Tuesday, March 20, 2018 of 0.7831 or 78.31%. Meanwhile, at the counter payment opportunity the smallest officer who does not serve the taxpayer at the counter payment is seen on Monday, March 19, 2018 of 0.3542 or 35.42%. To counter the delivery vehicle registration smallest attendant opportunities that do not serve the taxpayer is also seen on Monday at 0.9016 or 90.16%. This means that most of the time an existing officer is used to serve the taxpayer. In this case, the taxpayer will not experience a long queue and long waiting time to get service.

Based on the results of research conducted for the waiting time based on the desired aspiration level of taxpayers and parties

SAMSAT no more than 20 minutes and time officers are not serving the taxpayers allowed by SAMSAT of Tegal City is 20% of total working hours it can be said that the number of officers at registration counter, counter payment, and counters handling vehicle registration at SAMSAT Office of Tegal City that have been ideal that is 1 officer for each counters. So there is no need to add counter officers at each counter.

CONCLUSION

Based on the results of research that has been presented above, it can be obtained the following conclusion. (1) Queue system at SAMSAT Office of Tegal City follows *Single Channel Multiple Phase* (tandem or series queue) with queuing model $[G/G/1]:[GD/\infty/\infty]$, the distribution of tax payers' arrivals is not general distributed, the distribution of taxpayer service time is not general distributed, the number of counter staff is one, the service discipline is FIFO (First In First Out), and the maximum number of service and the source of arrival is infinite. (2) From the results of queue system analysis on each counter in the office of SAMSAT Kota Tegal, then the performance measure of queue system every count is shown in Table 2. (3) The optimal queue system based on the level of aspiration can be seen with the performance measures that have been obtained, it can generally be seen that the SAMSAT office of Tegal City has been able to serve the taxpayers who came well. This can be seen from the value of ρ (level of service usability) for each counter and from the queue not too long in line with the aspiration of taxpayers and the SAMSAT party in completing the validation of the vehicle STNK annual vehicle for 15 minutes. For placement of one officer at each counter at SAMSAT Office of Tegal City is appropriate. In addition to saving costs, the placement of one officer is in accordance with the maximum waiting time desired by visitors and the standard time owned by the SAMSAT office of Tegal City.

Based on these conclusions can be submitted some suggestions as follows.

The queue system at the registration counter, payment, and delivery of STNK at SAMSAT Office of Tegal City is quite good, visible from relatively short waiting time and the queue is not too long. Thus, taxpayers do not spend much time in the queuing system. Therefore, existing queuing systems need to be maintained.

Further research needs to be done by using a longer research time, so that more optimal results can be obtained. In addition, the calculation in terms of cost (*total cost*) issued by the agency if necessary to increase service facilities server counter (*server*).

For the next researcher who will perform queuing system analysis is expected to pay more attention to the condition of the queuing system in the institution itself. In addition, it should also consider other factors that may affect the queuing system in the agency.

REFERENCES

Ahse, N. S., Deoranto, P., dan Dania, W. A. P. 2014. Analisis Sistem Antrian Seri untuk Menentukan Tingkat Pelayanan yang Optimal pada Kasir (Server) Rumah Makan Kober Mie Setan dengan Metode Simulasi. *Jurnal Teknologi Industri Pertanian*, page: 1-9.

Alexander, Marcus, dan Cristobal. 2014. Flow Shop Scheduling with Heterogeneous Workers. *European Journal of Operation Research*, 273 (2): 731-720.

Dwidayati, N. K. 2005. Optimasi Sarana Pembayaran Rekening Telepon Berdasar Model Tingkat Aspirasi. *Jurnal MIPA*, 28(3): 155-162.

Ikrimah, A., Supriyono, dan Kharisudin, I. 2012. Analisis Antrian Single Channel Single Phase pada Loket Penjualan Tiket Kereta Api Kaligung di Stasiun Poncol. *Unnes Journal of Mathematics*, 1 (1): 26-32.

Kakiay, T.J. 2004. *Dasar Teori Antrian Untuk Kehidupan Nyata*. Yogyakarta: Andi.

Krishnamoorthy, B. 1962. On Poisson Queue with Two Heterogeneous Serves. *Journal Operation Research*, 2 (3): 321-330.

Marissa, F dan Sugito. 2009. Analisis Sistem Antrian Kereta Api di Stasiun Cirebon dan Stasiun Cirebon Prujakan. *Jurnal MIPA UNDIP*, 2 (2): 111-120.

Nurhayati, R., Rochmad, Kartono. 2014. Analisis Proses Antrian Multiple Channel Single Phase di Loket Administrasi dan Rawat Jalan RSUP Dr. Kariadi Semarang. *Unnes Journal of Mathematics*, 3(1): 1-6.

Sharma, A. K. dan Sharma, G. K. 2013. Queueing Theory Approach With Queueing Model: A Study. *International Journal of Engineering Science Invention*, 2 (2): 1-11.

Taha, H. A. 1997. *Riset Operasi Jilid Dua*. Jakarta: Binarupa

Tarliah, T. dan Dimyati, A. 1987. *Operations Research, Model-model Pengambilan Keputusan*. Bandung: Sinar Baru Algesindo.