QUEUE ANALYSIS SYSTEM FOR IMPROVING EFFICIENCY OF SERVICE

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ABSTRACT

This research aim to know how much most effective car queue done by PT. KAM, in Jakarta, a company moving to gives car repair service (car workshop) which during the time provide 6 kinds of service facility (M), whether with facility and employer addition will result maximal advantage. method of Research used is descriptive method with research Type of Case Study, while its Variable is probability no unit / people in system (Po), the total customer staying in queue system (Ls), mean of customer time await in queue system (Ws), total mean of customer stay in queue (Lq), and mean time of customer await in queue (Wq). Result of this research is adding one kind of server without officer of company may get advantage equal to Rp. 10.136.000 compared to add one server and one officer. Advantage obtained is equal to Rp. 8.936.000.

Keywords: *Queue, Efficiency, Service, Consumer, Competition*
**disguised company names*

INTRODUCTION

Background Problems

Agen Tunggal Pemegang Merek (ATPM) not only compete with each other outvariants of the car.they also compete in terms of providing services service.the goal is that consumers are more loyal to their brands and boost sales.one of the car manufacturers who do so is Ford Motor Indonesia (FIM).recently,they issued a warranty extension program vehicles named extended warranty program.they provide opprtunities to users of ford cars to extend their car warranty from 3 years becomes 5 years."this is choice to those who buy ford cars in 2009 and old car with 30.000 km or 3 years old,"said director of marketing,Davy Tuilan. (http://www.kontan.co.id/index.php/bisnis/news/7637/Ford-Makin-Agresif-Memperpanjang-Masa-Service)

Service company business activities is oriented on customer service and their customers.services that are considered both found and judged solely by consumers and customers.this makes the service companies are always trying to improve services to better fit with the expectations of their customers and consumers with a variety of ways and strategies.in this workshop is one example that provides services in the form of services.as we know more many who open these services and even among competing acquire and retain customers.competition is happening is happening is certainly encourage those who opened the workshop to be able to provide the best service for consumers and their customers with a wide range of service improvement,expanding range of other services that can be given and use a vaariety of new equipment that allows.

One of the main strategies to outperform competitors is to improve the quality of service to satisfy consumer desires and their customers.quality service can be improves in this workshop service,one of them is on proper queuing system is expected to create an effective and efficient service. One of the services provided by the workshop is to provide a wide range of services from vehicle maintenance to replacement spare parts in the vehicle.to perform this service,of course,determine who will be working on some mechanical with a certain time and to able to improve service and reduce queues of

vehicles waiting to do another this service is required of service patterns and proper queuing system,which is expected to meet the desires of consumers and customers will be providing the service.

Problem Identification

Based on the above description, so writer can identify the problem is: 1) How does the system services provided by PT. KAM on vehicles that come to do service?, 2) Whether queueing system model used by PT. KAM is right in an effort to improve the effectiness of service?, 3) What problems encountered in queuing system model used by PT. KAM and how efforts to solve?

Because of extensive research limit out study research following: 1) The cost of waiting is not included in the calculation of research, 2) Types of queueing system used is FIFO (Fisrt In First Out) with the level of queue unlimited and arrival patterns poisson or random.

Objectives And Benefit Research

The purpose of this research is: 1) For system services provided by PT. KAM on vehicles that come to perform service, 2) To determine whether the model of queueing system used by PT. KAM is right in an effort to improve the efficiency of service, 3) To find out the problems encountered in the queueing system model used by PT. KAM and effort to solve

BASIS THEORY

Queue Definition

According to Render etc. (2005. p. 418) queue is defined as persons or goods in line waiting to be served. Examples are patients in the hospital waiting to be served. Aminudin (2005, p.169) also stated there are some size performance of the system queue. Measures of performance include:

- The length of time customers must wait before it is served
- Percentage of time that service facilities are not used because there are no customers

Component System Queue Size of The Source Population.

Aminudin (2005, p.173) express the population size is usually divided into two, unlimited and limited. When relatively large population and the probability of a customer is not influenced by the number of customers who have been at a care facility, it can be assumed that the population is not limited. If the small population size and has a probability of arrival is changed drastically when there are members of the population who are receiving services, the population size is limited.

Pattern of Arrivals at the System

Aminudin (2005, p. 173) stated that operations research analysis has found that random arrival of the most suitable level describe by poisson distribution. How ever, not all arrival has a poisson distribution pattersn. There fore, previously confirmed in advance arrival distribution pattern before it is used to determine whether this distribution pattern suited to handle the queue system is used.

Queue Discipline

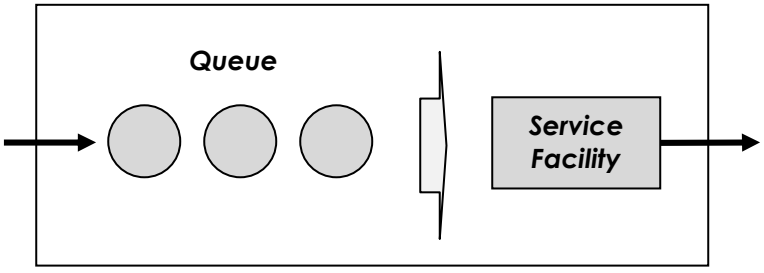
http://www.ittelkom.ac.id/library/index.php?view=article&catid=20%3Ainformatika&id=182%3Aqdisc&option=com_content&Itemid=15 said that there are five types of queues are often used in queuing theory,namely

1. *First Come First Served (FCFS)*
   FCFS queue discipline is one where customers are served first customer who came earlier.
2. *Last Come First Served (LCFS)*
   LCFS is one queuing discipline where most and customers who come to be served first.
3. *Service in Random Order (SIRO)*
   SIRO is one of the queuing discipline in which the service is done by random sequence
4. *Shortest Processing Time (SPT)*
   SPT is one of the queuing discipline in which customers who have service or processing time is the shortest that will be served or processed first
5. *General Service Discipline (GSD)*
   GSD used if the queue discipline is not determined and the results obtained will be equal to other queuing disciplines, such as FCFS and LCF

Basic Structure of Queueing System

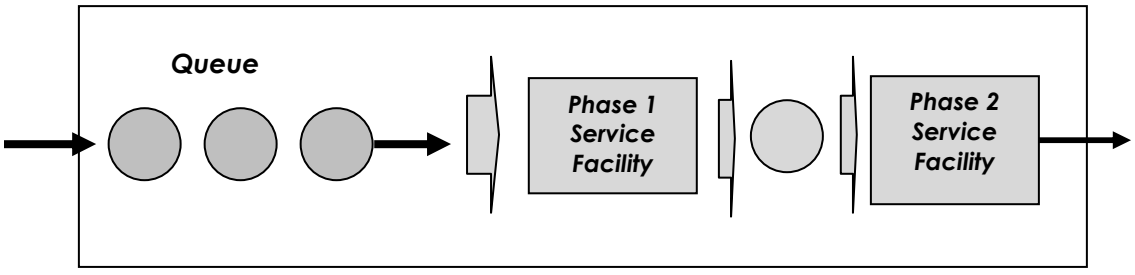
According kakiay queue process generally categorized into four basic structure according to the service facility.

Single-Channel, Single-Phase System



- *Single channels single phase*
  In this queue structure, the subject population being served summons will come, go and form a queue on one line and then be faced with a service facility, examples are post office counters that only have one service with one route queue.

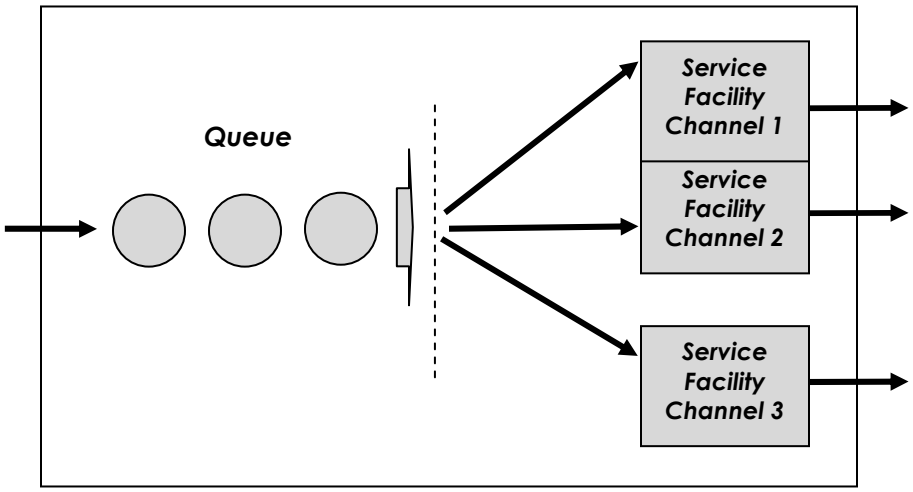
Single-Channel, Multi-Phase System



- *Single channel multi phase*
  in this queue structure,the subject population being served summons will come,go and form a queue on multiple streams of service and will deal with a care facility until service is completed.an example is a patient who wan treated to hospital.they have to queue up to register at the counter.once completed register,patients entered into the examination room.after getting a note from the

doctor's diagnosis,the patient will be lining up again to pay the doctor's inspection fee.

Multi-Channel, Single-Phase System



- *Multiple channel single phase*
  in this queue structure,the subject population being served summons will come,into the service system operated by several parallel service facilities are identical to the after-care facilities until completion of service.an example is a patient who was treated to hospital where there are few nurses and some doctors

Understanding efficiency and effectiveness

Efficiency is doing the task correctly,while effectiveness is doing the right task(doing the right things).effectiveness and efficiency is a valuable concept,but the effectiveness is much more important.
http://mrzie3r.wordpress.com/2007/03/22/efektifitas-vs-efisiensi/
Broadly speaking,the efficiency can be divided into two,namely technical efficiency and economic efficiency.technical efficiency associated with the use of machines or the execution of the production process,while economic efficiency related to cost,for reasons of efficiency.consumer queue worthy of further investigation in order to improve efficiency within the company

RESEARCH METHOD

Design Research

The research method used in preparing this essay is descriptive method.according Sugiyono (2004, p11) desrcriptive study was conducted to study know the value of independent variel,whether one or more ariabel without making comparison,or connect with other variables.the variable in this study is the probability there is no unit/ person in the system (**Po**),the number of customers who are in queuing system (**Ls**),the average time customers wait in the queue system (**Ws**), the number averages customer is in queue (Lq),and the average time customers wait in the queue (**Wq**).

Type and Sources of Data Research

This type of research is a case study.according to Umar (2003, p43) study case requires a deep and thorough study of a particular object that is usually relatively small during the period,including the environment.source data used is primary and seconday data.

Data collection techniques

In collecting the data required in this study we used several ways of data collection among other

1) Research field:interviews and observation
2) Research libraries

Data analysis techniques

After the necessary data collected,it was held data analysis using the model of queuing system.here will be desrcribed first models of the existing queuing system according to Heizer and Render (2005, p771) are

a) Model M/M/I
   This model has a number of channel 1 pc,the number of single phase,arrival pattern poisson,the pattern of exponential service, infinite source population (unlimited), FIFO (*first-in,first-out)* queue discipline
b) Model M/M/S
   This model has a few channels(n piece),the number of single phase,the pattern of arrival poisson,exponential service pattern,the source population in infinite (unlimited),sidcipline, FIFO queu
c) Model M/D/I
   This model has a number of channel 1 pc,the number of single-phase,poisson arrival pattern,the pattern of constant service,the source population in infinite (unlimited), FIFO queue discipline.
d) Limited model population
   This model has a number of channel 1 pc,the number of single phase,the pattern of poisson arrivals,exponential service pattern,the source population (limited), FIFO queue discipline.

   Of the model above queuing system,which is used as a basis for analyzing such data is a model M/M/S because according to the layout of the research object have multiple channels(n pc),number of single-phase,poisson arrival pattern,the pattern of exponential service,the source population is infinite (unlimited), FIFO queue discipline.

According to Heizer and Render (2005, p774) formula that uses a queuing system model M/M/S such as:

- The probability that there are 0 (zero) people or units in the system is

$$\mathbf{Po} = \frac{1}{\left[\sum_{n=o}^{M=1} \frac{i}{n!}\left(\frac{\lambda}{\mu}\right)^{n}\right] + \frac{1}{M!}\left(\frac{\lambda}{\mu}\right)^{M} \frac{M\mu}{M\mu - \lambda}}$$

- The average number of people or units in the system is

$$\mathbf{Ls} = \frac{\lambda\mu\left(\frac{\lambda}{\mu}\right)^{M}}{(M-1)!(M.\mu - \lambda)^{2}}\ Po + \frac{\lambda}{\mu}$$

- The average time a uit spends in the waiting line or being serviced is

$$\mathbf{Ws} = \frac{\mu\left(\frac{\lambda}{\mu}\right)^{M}}{(M-1)!(M.\mu-\lambda)^{2}} \text{ Po} + \frac{1}{\mu} = \frac{Ls}{\lambda}$$

- The average number of people or units in line waiting for service is

$$\mathbf{Lq} = \mathbf{Ls} - \frac{\lambda}{\mu}$$

- The average time a person or units spends in queen waiting for service is

$$\mathbf{Wq} = \mathbf{Ws} - \frac{1}{\mu} = \frac{Lq}{\lambda}$$

- Utilization factor for system

$$\rho = \frac{\lambda}{\mu}$$

- Probability of 0 (zero) units in the system

$$\mathbf{1} - \frac{\lambda}{\mu}$$

Description:

M = number of channels open
λ = average arrival per periode
μ = mean the person or unit that can be served per periode

ANALYSIS AND DISCUSSION

A. How Service at Arrivals for Conducting Vehicle Services (1)

How to service the vehicles that come to perform the service can be described as follows:

1. Vehicles entering must be recorded first in the list of vehicles entering the day. The recording includes the number of vehicles, vehicle owners, vehicle kilometers, vehicle complaint.
2. Vehicles that have been recorded are reported to the Chief Mechanic. Head of the Mechanical that will determine the vehicle will be done by the mechanics and control the course of servicing the vehicle.
3. Vehicles that have been recorded can soon get service if there are places available or there are mechanics who can work immediately, otherwise the vehicle would have to wait to get his turn.
4. The finished vehicle serviced later have to be reported for payment.

B. Application of Queuing System Model.

When applying the model of queuing system M / M / S on the company, which this model has several channels (n), the number of single-phase, Poisson arrival pattern, the pattern of exponential services, the source population is infinite (unlimited), FIFO queue discipline. For more details, the following will describe how the application of queuing system models based on components:

1. Characteristics of arrival (*Arrivals characteristic*)
   a) The size of the source population (*size of the source population*): The source of the population are consumers or customers who came to wait for the flow to perform services that are not limited to (unlimited infinite)

b) Arrival pattern (*pattern of Arrivals at the system*): The pattern of his arrivals follows a Poisson distribution pattern because the pattern of arrival of the source population at random.
c) The arrivals behavior (*behavior of Arrivals*): For this can not be ascertained because it depends on the attitude of individual consumers or customers.

2. Characteristic path queue (*waiting-line characteristics*).
   a) The length of the queue (*length*): Length of the queue is unlimited (unlimited) depending on how many vehicles are coming.
   b) Discipline queue (*queue discipline*): queue discipline used is First In First Out meaning first come first served.
3. Characteristics of facility service (*service facility system configurations*)
   a) The basic structure of queuing systems (basic queuing system configurations): The basic structure of the queue system used is a multiple-channels, single-phase in which in this case a vehicle that came to be placed on the parts that match the required service and after completion to exit the system.
   b) Disteribusi service time (*service time distribution*): Distribution patterns of service use because of the exponential distribution of service time are random.

C. Queue Systems Analysis in Efforts to Achieve Efficiency Services

To see if the when using the model queue system is right now in an effort to improve the efficiency of services will require data that can support it include.

1. The number of customer arrivals per hour
2. The average number of customer arrivals
3. Average complete mechanical services per hour of service
4. Calculations to measure the state of the queue system when applying the model M / M / S

Calculation steps in the analysis of queuing systems in order to achieve the efficiency of service

1. Determination of Average Number of Customers Coming

Date	Number of Vehicles
05 October 2009	33
06 October 2009	30
07 October 2009	35
08 October 2009	35
09 October 2009	39
10 October 2009	56
Total	**228**

Source: Company (2009)

Table 1. Number of Customers Coming Over 6 days

Data on the number of arrivals of customers is taken for 6 days as a sample of observations made on the arrival of customers. The number of arrivals of customers is required in determining the average number of customer arrivals per unit time (λ) Unit of time used here is the clock.

Arrival Hour	October 9	October 10	October 11	October 12	October 13	October 14	Total
08.00-09.00	7	10	6	6	6	9	44

09.00-10.00	6	6	6	5	5	5	33
10.00-11.00	4	1	3	4	5	5	22
11.00-12.00	4	2	6	3	3	8	26
12.00-13.00	1	2	3	3	3	6	18
13.00-14.00	4	3	3	4	7	7	28
14.00-15.00	3	3	5	4	6	8	29
15.00-16.00	3	3	3	5	3	5	22
16.00-17.00	1	-	-	1	1	3	6
Total	**33**	**30**	**35**	**35**	**39**	**56**	**228**

Table 2. Total Customer Arrivals Per Hour

The average number of customer arrivals (λ)

$$\frac{total}{time} = \frac{228}{54} = 4,2222 \approx 4 customers \ / hour$$

2. The ability of the mechanics in completing service

In providing care services to the vehicles that come the company provides as many as 6 units of service facilities services (M), which effectively are often used, and the company also set a working day from Monday to Saturday, with hours of work per day for 9 hours starting from 08.00 - 17.00 hours including breaks. So the total hours worked per week was 6 days x 9 hours = 54 hours.

Interval Time (min)	Frequency (fi)	Value (Xi)	Relative Frequency (%)	Fi.Xi
0-30	30	15	14,09	450
31-60	108	45,5	50,7	4914
61-90	51	75,5	23,94	3850,5
91-120	24	105,5	11,27	2532
Total	**213**		**100%**	**11746,5**

Table 3. Average Number of Services Per Hour Mechanical Finishing

Average complete mechanical service service (μ)

$$\frac{\sum fi.Xi}{\sum fi} = \frac{11746,5}{213} = 55,1479 \approx 55$$ minutes **or** $$\frac{60}{55} = 1,0909 \approx 1$$ customers / hour

Description:

a. The time interval taken from the observations the average time that is most commonly done by the mechanics in completing a service that is between 00-30 minutes to 120 minutes.
b. Based on observations of the frequency or number of vehicles that can be completed in as much as 213 vehicles, while 15 vehicles completed in more than 120 minutes.
c. To calculate the value (Xi) can be seen from the following calculation

The time interval	Value (Xi)
0-30	(0+30)/2=15
31-60	(31+60)/2=45,5
61-90	(61+90)/2=75,5
91-120	(91+120)/2=105,5

d. To calculate the relative frequencies can be seen from the following calculation:

	Frequency (fi)	Relative Frequency (%)
	30	(30/213) x 100% = 14,09%
	108	(108/213) x 100% = 50,70%
	51	(51/213) x 100% = 23,94%
	24	(24/213) x 100% = 11,27%
Total =	213	100 %

e. For the calculation fi.Xi obtained by multiplying the frequency (fi) and value (Xi)

So from the above calculation shows that the average mechanical ability resolve service customer service is as much as **1** per hour while the average length of time to complete mechanical service is a service for ***55*** minutes

3. Analysis of efficiency of service using a queuing system approach is used.

Under this calculation will be shown when using queuing model used is a model M / M / S by using ***6*** units of service facilities along with the calculation of the cost of these services:

1. Hours 08:00 to 09:00 with a note: M = 6 = 6 = 7

a. Probability of no customers who queued to be served (*The probability That there are **0** (zero) people or units is the system* / ***Po***)

$$\mathbf{Po} = \frac{1}{\left[\sum_{n=o}^{M=1} \frac{i}{n!}\left(\frac{\lambda}{\mu}\right)^{n}\right] + \frac{1}{M!}\left(\frac{\lambda}{\mu}\right)^{M} \frac{M\mu}{M\mu - \lambda}}$$

Where:

M = number of service facilities (channel)

λ = Average number of customer arrivals per period

μ = Average number of customers who can be served per period

$$\mathbf{Po}=\frac{1}{\left[\frac{1}{0!}\left(\frac{7}{6}\right)^{0}+\frac{1}{1!}\left(\frac{7}{6}\right)^{1}+\frac{1}{2!}\left(\frac{7}{6}\right)^{2}+\frac{1}{3!}\left(\frac{7}{6}\right)^{3}+\frac{1}{4!}\left(\frac{7}{6}\right)^{4}+\frac{1}{5!}\left(\frac{7}{6}\right)^{5}\right]+\frac{1}{6!}\left(\frac{7}{6}\right)^{6}\left(\frac{(6).(6)}{(6).(6)-7}\right)}$$

$$\mathbf{Po}=\frac{1}{[1+1{,}16+0{,}67+0{,}26+0{,}07+0{,}008]+[0{,}003.(1{,}24)]} \longrightarrow \mathbf{Po = 0{,}315 \approx 3{,}1\%}$$

That is probably not the customer who was in the system: **3.1%**

b. The average number of customers in the system (*The average number of people or units in the system* / ***Ls***)

$$\textbf{Ls} = \frac{\lambda\mu\left(\frac{\lambda}{\mu}\right)^{M}}{(M-1)!(M.\mu-\lambda)^{2}}\,Po + \frac{\lambda}{\mu} \longrightarrow \textbf{Ls} = \frac{(7).(6).\left(\frac{7}{6}\right)^{6}}{(6-1)!(6.6-7)^{2}}\,0{,}315 + \frac{7}{6}$$

Ls = 1,16 ≈ 1 customer

This means that on average there are about 1 subscriber who was in the system

c. The average number of customers waiting to be served (*The Average number of people or units in line waiting for service* / ***Lq***)

$$\textbf{Lq} = \textbf{Ls} - \frac{\lambda}{\mu} \longrightarrow \textbf{Lq} = 1{,}16 - \frac{7}{1} \longrightarrow \textbf{Lq = 41,1777}$$

This means that on average there are **41.1777** customers who wait in the queue to get service service.

d. The average time customers in the system (*The average time a unit spends in the waiting line or being serviced* / ***Ws***)

$$\textbf{Ws} = \frac{\mu\left(\frac{\lambda}{\mu}\right)^{M}}{(M-1)!(M.\mu-\lambda)^{2}}\,\mathrm{Po} + \frac{1}{\mu} = \frac{Ls}{\lambda} \longrightarrow \textbf{Ws} = \frac{4{,}81777}{4} \longrightarrow \textbf{Ws} = 1{,}204$$

That means the average time customers were served during the **72.26** min.

e. The average time customers waited to be served (*The average time a person spends or units in the queue waiting for service* / ***Wq***)

$$\textbf{Wq = Ws} - \frac{1}{\mu} = \frac{Lq}{\lambda} \qquad \textbf{Wq} = \frac{0{,}5700}{4} \qquad \textbf{Wq} = 0{,}1425 \text{ hours} \approx \textbf{8,55} \text{ minutes}$$

That means the average time a customer waiting to get service during the service is **8.55** minutes.

The following calculation will be done to get the total cost incurred when the number of service plus the service facilities into **7** pieces.

a. Probability of no customers who queued to be served (*The probability That there are* 0 *(zero) people or units in the system* / ***Po***)

$$\textbf{Po} = \frac{1}{\left[\begin{array}{l}\frac{1}{0!}\left(\frac{4}{1}\right)^{0}+\frac{1}{1!}\left(\frac{4}{1}\right)^{1}+\frac{1}{2!}\left(\frac{4}{1}\right)^{2}+\frac{1}{3!}\left(\frac{4}{1}\right)^{3} \\ +\frac{1}{4!}\left(\frac{4}{1}\right)^{4}+\frac{1}{5!}\left(\frac{4}{1}\right)^{5}+\frac{1}{6!}\left(\frac{4}{1}\right)^{6}\end{array}\right]+\frac{1}{7!}\left(\frac{4}{1}\right)^{7}\left(\frac{(7).(1)}{(7).(1)-4}\right)}$$

$$\textbf{Po} = \frac{1}{[1+4+8+10{,}6667+10{,}6667+8{,}5333+8{,}5333]+[3{,}2508.(2{,}3333)]}$$

Po = 0,0178 ≈ 1,78%

That is probably the lack of customers in the system amounted to **1.78%**

b. The average number of customers in the system *(The average number of people or units in the system /* ***Ls****)*

$$\textbf{Ls} = \frac{\lambda\mu\left(\frac{\lambda}{\mu}\right)^{M}}{(M-1)!(M.\mu-\lambda)^{2}}\ Po + \frac{\lambda}{\mu} \longrightarrow \textbf{Ls} = \frac{(4).(1).\left(\frac{4}{1}\right)^{7}}{(7-1)!(7.1-4)^{2}}0{,}0178 + \frac{4}{1}$$

Ls = 4,1800 ≈ 4 customers

This means that there are about **4** customers who were inside the system.

c. The average number of customers waiting to be served *(The Average number of people or units in line waiting for service /* ***Lq****)*

$$\textbf{Lq} = \text{Ls} - \frac{\lambda}{\mu} \rightarrow \textbf{Lq} = 4{,}1800 - \frac{4}{1} \longrightarrow \textbf{Lq} = \textbf{0,1800} \approx \text{none 1 customer any}$$

This means that no one customer is waiting in the queue to get service service.

d. The average time customers in the system (*The average time a unit spends in the waiting line or being serviced /* ***Ws***)

$$\textbf{Ws} = \frac{\mu\left(\frac{\lambda}{\mu}\right)^{M}}{(M-1)!(M.\mu-\lambda)^{2}}\ \text{Po} + \frac{1}{\mu} = \frac{Ls}{\lambda} \longrightarrow \textbf{Ws} = \frac{4{,}1800}{4}$$

Ws = 1,045 ≈ 62,7 minute

That means the average time customers were served during the **62.7** minutes.

e. The average time customers waited to be served (*The average time a person spends or units in the queue waiting for service /* ***Wq****)*

$$\textbf{Wq} = \text{Ws} - \frac{1}{\mu} = \frac{Lq}{\lambda} \qquad \textbf{Wq} = \frac{0{,}1800}{4} \qquad \textbf{Wq = 0,045 ≈ 2,7 minutes}$$

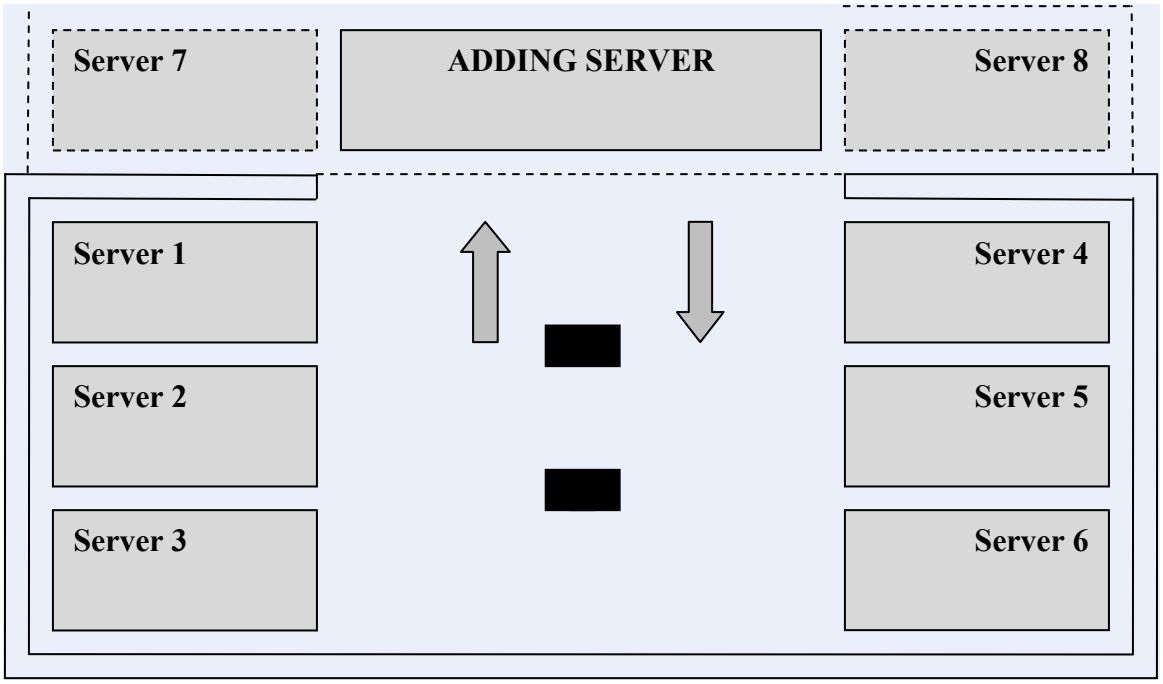
That means the average time a customer service waiting to get service is over **2.7** minutes.

After doing the calculations to measure the state of the queue system when applying the model M / M / S, then to see a comparison of the number of service-care facilities are now used as many as **6** units with the addition of service facilities and service into **7** pieces **8** pieces.

Information		M = 6	M = 7	M = 8
The probability of no customers who queued to be served	**Po**	1,67%	1,78%	1,81%
The average number of customers in the system	**Ls**	4,5700	4,1800	4,0588
The average number of customers waiting to be served	**Lq**	0,5700	0,1800	0,0588
The average time served customers	**Ws**	1,1425	1,0425	1,0147
The average time customers waited to be served	**Wq**	0,1425	0,0425	0,0147

Table 4. Results Calculation of Queue Systems Model with The Addition of Service Facilities Service

D. Queuing System Model Constraints and Efforts Used solution.



Picture 1. Server Company

Initially the company has **6** servers, would make additions to **7** servers as shown in the image above. The addition of this server would require a fee. As for the costs related to the addition of the server described as follows:

Expenditure		
7	Cost	Rp0.00
	Computer	Rp. 15,000,000.00
	Leaver	Rp. 35,000,000.00
	Equipment	Rp. 1,500,000.00
	Building	Rp. 20,000,000.00
	Salary	Rp. 6,000,000.00
	Total	**Rp. 77,500,000.00**

Table 5. Additional Cost Servers

Break Event Point Accumulation calculation with Addition of 1 Servers

Income Calculation				
7	**Estimated**	**Number of Cars**	**Average Revenue per Car**	**Income**
	05 Oktober	33	Rp 71,000.00	Rp 2,343,000.00
	06 Oktober	30	Rp 98,000.00	Rp 2,940,000.00
	07 Oktober	35	Rp 84,000.00	Rp 2,940,000.00
	08 Oktober	35	Rp 93,000.00	Rp 3,255,000.00
	09 Oktober	39	Rp 121,000.00	Rp 4,719,000.00
	10 Oktober	56	Rp 102,000.00	Rp 5,712,000.00
	Total	**228**	**Rp 569,000.00**	**Rp 21,909,000.00**

Table 6. Company Revenue

With the assumption of revenue as follows, for a month can be obtained from a profit of (Rp.21.909.000 X 4) = Rp.87.636.000 thus obtained a profit of (Rp.87.636.000 - Rp. 77.5 million) = Rp. 10,136,000. With revenues of Rp.21.909.000 per week, and by the time of arrival of customers who remain sepert listed in the table above, it is obtained Break Event Point (BEP) for 22 days, calculation is as follows:

BEP = (Total Expenditure / Total Revenue) * 24 days
BEP = (Rp.77.500.000/Rp. 87.636 million) * 24 days
BEP = 0.8843 * 24 days
BEP = 22 days

Description:
1 month 24 days due to the time calculated mechanical work for 1 week is 6 days so that 1 month = 6 * 4 to 24 days.

Break Event Point Accumulation calculation with the addition of 1 server and the addition of a labor

The costs associated with the addition of labor so that the experience increased costs.

Expenditure		
7	Cost	Rp0.00
	Computer	Rp15,000,000.00
	Leaver	Rp35,000,000.00
	Equipment	Rp1,500,000.00
	Building	Rp20,000,000.00
	Salary	Rp7,200,000.00
	Total	**Rp78,700,000.00**

Table 7. Cost by Adding One Additional Server Manpower

By using the same data with previous research, companies can gain profit of Rp. 21.909.000,- as shown in the previous tables. With the assumption that income, for one month to obtain a profit of (Rp.21.909.000 X 4) = Rp.87.636.000 and thus profits to be had for (Rp.87.636.000 - Rp. 78.7 million) = USD . 8.936 million. With the arrival time of customers who remain sepert listed in the table above, then the company can do Break Event Point (BEP) for 22 days. BEP calculation was as follows:

BEP = (Total Expenditure / Total Revenue) * 24 days
BEP = (Rp.78.700.000/Rp. 87.636 million) * 24 days
BEP = 0.8980 * 24 days
BEP = 22 days

From the above calculation can be seen the excess profits gained by adding a server with or without adding an employee in the workshop.

Expenditure	**Expenditure**

7	Cost	Rp 0.00
	Computer	Rp 15,000,000.00
	Leaver	Rp 35,000,000.00
	Equipment	Rp 1,500,000.00
	Building	Rp 20,000,000.00
	Salary	Rp 6,000,000.00
	Total	**Rp 77,500,000.00**

7	Cost	Rp 0.00
	Computer	Rp 15,000,000.00
	Leaver	Rp 35,000,000.00
	Equipment	Rp 1,500,000.00
	Building	Rp 20,000,000.00
	Salary	Rp 7,200,000.00
	Total	**Rp 78,700,000.00**

Table 8. Additional Costs Server with or Without the Addition of One Worker In Auto

From the financial calculations above can be seen that the greater the profits, if adding one server without adding a single employee, compared to adding one server and adding a single employee. By adding a single server without employee company is able to earn a profit of Rp. 10.136 million as compared to adding one server and one employee. Gains derived soon is Rp. 8.936 million.

The conclusion was that the addition of only 1 pc server as compared with the addition of 1 pc server with 1 employee more profitable. However, the addition of a server is usually followed by the addition of labor, so in this case the preferred ratio is the ratio between the main server which amounted to 6 servers, with the addition of 1 server with 1 piece of fruit employees.

Accumulation Calculation Server Point Break Main Event

Companies would have to use an existing queue sisitem as land revenue potential. But through our research, we have calculated that the addition of 1 piece of the server that must be followed by an employee is an advantage for the company. To show this, we make a comparison between the main server which amounted to six servers with the addition of a server followed by 1 employee.

Through the existing assumption that the cost required to add a new server with fruit unit followed an employee requires a fee of Rp.78.700.000 thus can be assumed that the costs used to make 1 piece of the server from 6 main server at Rp.80.000 .000.

Income Calculation				
7	**Estimated**	**Number of Cars**	**Average revenue per car**	**Income**
	05 oktober	33	Rp 71,000.00	Rp 2,343,000.00
	06 oktober	30	Rp 98,000.00	Rp 2,940,000.00
	07 oktober	35	Rp 84,000.00	Rp 2,940,000.00
	08 oktober	35	Rp 93,000.00	Rp 3,255,000.00
	09 oktober	39	Rp 121,000.00	Rp 4,719,000.00
	10 oktober	56	Rp 102,000.00	Rp 5,712,000.00
	Total	**228**	**Rp 569,000.00**	**Rp21,909,000.00**

Table 9. Company Revenue Over 1 week

Thus, using research data obtained for 1-month earnings results for Rp.21.909.000 X 4 = Rp.87.636.000 with the assumption that the customer arrival rate unchanged. From the above calculation is obtained gain 1 piece main server for Rp.87.636.000 - than Rp.80.000.000 = Rp.7.636.000. From the above data can also be taken into account when Break Event Point, using 1 piece of the main server is for 22 days with a record above calculation is used to compare the 1 server that previously was founded with the

addition of 1 server that comes with 1 pegawai.Berikut Break Event Point calculations using number of customers who remain listed in the table above.

BEP = (Total Expenditure / Total Revenue) * 24 days
BEP = (Rp.80.000.000/Rp. 87.636 million) * 24 days
BEP = 0.9128 * 24 BEP = 22 days

It can be concluded that a server that used to obtain a profit of Rp.7.636.000 when the server is managing the 912 car for 1 month and accounting for only 1 server alone, using a fixed number of arrivals. While the addition of new server 1 using 1 employees can earn a profit of Rp. 8.936.000, when the server is managing the 912 car for 1 month using a fixed number of arrivals.

The unexpected cost of Rp.20.000.000. Unexpected costs are obtained from the calculation of the main server. As noted in earlier that the total expenditure is used to build servers with 6 units employing five employees of Rp. 500.000.000,- and assuming one of the main server so that the total expenditure than Rp. 80.000.000,- 6 servers amounted Rp. 80.000.000 x 6 = Rp. 480.000.000 so its still Rp.20.000.000 remaining. Because of limited data and the results of our interviews are assuming 20,000,000 into unexpected costs. To calculate the unexpected costs can be seen as follows:

Unexpected costs = (Rp.20.000.000 / Rp.480.000.000) X 100%
Unexpected costs X 100% = 0.0416
Unexpected costs = 4.16%

In conclusion: the net profit earned by 1 piece of the server from 6 main server manages 912 car with registration [Rp.7.636.000 - (Rp.7.636.000 Rp.317.657 x 4.16% =) = Rp.7.318.342] and julmah gain a new server with 1 employee to manage the 912 car registration [Rp.8.936.000 - (Rp.8.936.000 Rp.371.737 x 4.16% =) = Rp. 8.564.262

CONCLUSION

From the above results it can be deduced as follows: **1)** Company apply the model of queuing system M / M / S, where the queue system has several channels, the number of single phase, the pattern of Poisson arrivals, exponential service patterns, the source population is infinite (unlimited), FIFO queue discipline, **2)** Statiscally, the addition of server will increase the service time so that the number of customers who enter get faster service, but the addition of 1 piece of server cost. Through the management of financial calculations, the addition of servers to obtain the benefits required the addition of 1 server with 1 piece of fruit employees. Addition of the server requires a fee of Rp.78.700.000, 3) the Company has no constraint in this case but to improve efficiency of service, need to add one new server comes with one employee.

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