Queue System Improvement of Certificate Checking For Increasing Public Service in Bogor District Land Registry Office

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Abstract- Land Registry Office is an government institution that engaged in service field. In this sector, the increase of people satisfaction is the most important thing that needs to be maintained. However, the limited service resources make it not comparable to the rate of service request. Therefore, it will cause queue. One of the services in Bogor District Land Registry Office which has a high intensity of service request every day is certificate checking. This study aims to analyze the performance of queue service system of certificate checking and to develop a model of service that is improved and can meet the needs of the service. The development of queue model is done by making a simulation using the software Arena 14.00.00. Arena simulation results were tested by t-test to verify that the simulation model has been represented of certificate checking service in Bogor District Land Registry Office. Analyses of the simulation include the analysis of waiting time and queue length, utility analysis, and bottleneck analysis. From the analysis, there are inefficiencies that result in long waiting periods and a large number of files that have not been processed. the percentage of files that can be completed in every day at the existing condition is only 57.40% of the incoming beam. Scenario improvements were made to cope with the jam on phase experiencing a bottleneck. The improvement scenario can increase number of output to 96.20%, and boost the waiting time to become 0.278 hours from the previous of 1.56 hours.

Index Terms- Queue, Arena Simulation, Scenario Improvement

I. INTRODUCTION

Checking service is one type of duties and functions of the Land Registry Office. Checking service activities are intended to provide certainty about the authenticity of the certificate and that the certificate being checked is not being involved in the conflict and dispute. As is known, certificate has significant proof of ownership of a parcel of land. The authority to inspect and certify the authenticity of the certificate is on the District Land Registry Office/City where the certificate is issued.

Bogor District Land Registry Office is one of the Land Registry Offices in West Java that is classified as an A Class Land Registry Office pursuant to *Peraturan Kepala Badan Pertanahan Nasional* RI (PERKABAN) No. 1 of 2013. The Land Registry Office is included in Class A is the Land Registry Office which has great volume of services.

Land Registry Office is an office engaged in the service sector. The service sector deals with the increase in people's satisfaction as the most important thing that needs to be improved

The main factor in the quality of services is the easy access to service facilities that include location, time of service operations and minimum waiting time to get the services (Sridhar, 2013).

The high needs of communities to their land lead to the high intensity of land certificate checking service request. This phenomenon causes long queues in Land Registry Office.

The high society needs result in the high volume of applications that are not comparable with the Land Registry Office service capacity. This triggers to inefficiency and ineffectiveness in service system. As the consequence, congestion (bottlenecks) emerges and the waiting time becomes longer. This results in a decrease in public satisfaction with the service. A study by Noor Azizah in 2008 in Bogor District Land Registry Office shows that the dimensions of service quality give positive and significant impact on the improvement of people's satisfaction in terms of the dimensions of reliability and empathy.

The key operating characteristics for a system are shown to be (1) utilization rate, (2) percent idle time, (3) average time spent waiting in the system and in the queue, (4) average number of customers in the system and in the queue, and (5) probabilities of various numbers of customers in the system. (Chowdury,Rahman and Kabir. 2013)

A consumer experience in the long waiting time at a facility service significantly affects the overall perception of the services provided (Maister, 2005). Although customers have been served efficiently and politely, bad experiences may still appear in the waiting time and can affect the overall assessment of the quality of service. Analytical approach in this service issue is a matter that concerns the speed of queuing service performance to the applicants. The queue in question here is queuing service which checks the application for land titles.

In the queue situation, perception plays an important role. An unpleasant experience in waiting affect the perception of entire service (Nuryani, 2013). Process wait or queue containing the element of time. Unpleasant feeling when queuing one of which relates to how people make sense of time in the queue

Norman (2008) there are eight design principlefor waiting line, ie: 1) emotion dominate, 2) eliminate confusion, 3) the wait must be appropriate, 4) set expectations, 5) keep People occupied, 6) be fair, 7) end strong, start strong, 8) memory of an event is more important than the experience.

Queuing problems are associated with management's decision to cope with the demand for service capacity in various services. At the time of application for high service, the service facility is very busy, causing long queues and taking quite a long time. Conversely, when the demand is low, the facility becomes idle and inefficient. Management needs to provide optimal care and facilities so as to serve consumer demand that is varying. In addition, the service must always be optimized so that the satisfaction increases. Additionally, high utility services also affect the performance of employees who may be saturated and there would be a decline in the performance and quality of service of employees.

Performance of the queue is also affected by the arrival rate and speed of service. The arrival rate generally cannot be controlled by the Land Registry Office, while improving speed of service is difficult because it is tied with the applicable standard operating procedures. In addition to the high number of applications for land registration services, the number of steps that must be passed also adds to the high risk of the queue and the length of time needed for completion.

At a production process (a process which one will support the others as a whole), inefficiencies toward a stage will affect the other stages that have impact on the resulting output. This will not only disrupt the production process but also the quality of production (Astuti, 2002). It requires a simulation of the production line to optimize the number of service facilities.

The purpose of this study is to:

1. describe the existing condition of the certificate checking service operations in Bogor District Land Registry Office;
2. analyze the performance of the queuing system checking service of land titles;
3. develop queue repairs needed to improve productivity checks of certificate services in accordance with the level of the request.

The study was conducted using a case study approach to service certificate checking Bogor District Land Registry Office. This study was conducted to examine the performance of the queuing system for the land certificate checking service improvement that can be done to optimize the performance of services. This effort is expected to increase community satisfaction.

II. Research Methods

The types of data used in this study are primary direct observation in the form of: number of arrivals, arrival time, service time, the service process flow and in-depth interviews

The steps done in this study were:

1. Test the adequacy of the data
   The first step was the collection of observational data. Observational data were taken with care and had a sufficient number of quantitative reprensentatif . The required number of data observations is expressed in the following equation: (Barus, 2005)

$$N' = \left(\frac{k/s \sqrt{N \sum X_i^2 - (\sum X_i)^2}}{\sum X_i} \right)^2 , N > N'$$

   Where:
   N' = the number of observation that should be done
   k = level of confidence in observation
   s = the degree of accuracy in observation
   N = the number of observation made
   Xi = observational data
2. Testing Distribution
   If a distribution of the population is not known, it must be estimated . Empirical distribution functions estimate the true function of the underlying distribution . Testing distribution is done by using the Kolmogorov - Smirnov test . Kolmogorov - Smirnov test is an alternative test of Chi -square test to test the hypothesis that the distribution of observed variables differ from the expected variable distribution (Nazir, 1988) .
3. Simulate the model
   Land certificate checking service flow was simulated using the software Arena. Ward (2012) used the software of Arena to compare the efficiency of existing conditions with the proposed conditions. The number of stages and varying arrival distribution and service in the process of checking the certificate of service cause complexity and are quite difficult to be calculated analytically. Therefore, simulation software of Arena was applied in accordance with the existing conditions of service of checking certificates. Simulation is the process to mimic the real system to evaluate and improve system performance.
4. Validation Test T - Test
   Data simulation results need to be compared with the data obtained from the observation of reality. It is necessary to validate that the simulation model has represented a real condition. Hypothesis testing using t-test comparisons in this study was carried out by using the following hypotheses: (Sumarwoto&Marwani, 2012)
   H0 = There is no difference between simulations and the existing.
   H1 = There is a real difference between simulations with the existing.
5. Analysis of Simulation Results
   From the simulation results by using the software of Arena, there will be analysis of the level of utility services , the analysis of bottleneck , the waiting time, and queue length of service. Then, improvements on queue will be conducted by creating an improved service based scenario by reducing the waiting time and the comparison between the situation of the queue that is running with the condition of queue which is expected.

III. Results and Discussion

A. Land Certificate Checking System

Land certificate checking service activities are required to check the validity and authenticity of the certificate of land proposed by the applicants. The land certificate is a means of proof of ownership of a parcel of land.

Conditions of the application for a land certificate checking service based on the flow are given below:

1. The applicant who comes to the Land Registry Office goes into service. He then heads into the service counter for checking the certificates, submits a request file consisting of: application form (provided by the Land Registry Office), land

certificate, copy of ID, and the power of attorney (if authorized).

2. Officers in the counter (1 person) will receive the file and check the documents. If the file is incomplete, the clerk will inform the documents that need to be completed.
3. The applicant files a complete document and submits it to the officers and then they will search the location based on land book data in the archives. The time needed from the counter to the archives is 30 seconds.
4. Archive room officers (2 people) find a book that land is in accordance with the certificate applicant HAT sorted by village name, type and number of Rights. Land book that has been found and then inserted in the Certificate HAT and placed in the archive to be taken by the counter clerk for certificate testing.
5. Officers learn and observe the certificate (1), take the certificate and land book records available in the counter to check the compatibility between the land book and certificate. The points examined are namely the village name, type of rights, certificate number, number GU Land History and Notes. if there is a discrepancy, the certificate will be returned to the archivist to check back and match it with the data in the land book. Additionally, Cap officers also check whether the certificate is already plotting Figure Measure (GU); if not, the certificate will be returned to the clerk to be given back to the applicant in order to get to the counter plotting on floor 2. Once checked, HAT certificates and land book then are stamped stamp and handed over to the officer of Warrant Issuance of Deposit (SPS).
6. Officers SPS (1) receive the Certificate and Land Book and they are then collected on behalf of the applicant to make SPS. SPS contains information about the applicant's name, file number being requested, the amount of the requested file as well as the nominal amount of costs to be paid. SPS is printed and handed to the clerk, while the certificate and the land book are handed over to the data input clerk.
7. Data input officers (1) record the data of the applicant, the certificate number and the type of certificate to the internal applications as well as noting the time and date for checking.
8. The certificate and the land book are handed over to officials of verification (1) to re-examine the authenticity of the certificate in the form of paper certificates, certificates history, officials who signed the certificate to be matched with the land book. After the certificates and books mention the land, they are then sent to the clerk to be submitted to the applicant.

There are six (6) steps required in the certificate checking service activities , namely: 1) File reception counter ; 2) land book archive search; 3) The testing certificate ; 4) Issuance of SPS ; 5) Data Entry ; 6) Verification of officers certificate. It can be concluded that the structure of certificate checking service activities is a multi -channel multi- phase.

B. Adequacy Test Data

The data taken are considered fairly representative of the population if N>N' (Barus 2005). Data assessed for adequacy are service time data at each phase of the service

Table 1. Results of testing of adequacy of observational data

Activity	(N)	(N')	Explanation	Average time (Second)
Phase 1 (Counter Officer)	82	64	Sufficient	14,44 (0:0:14,44)
Phase 2 (archivist)	137	33,21	Sufficient	163,04 (0:02:43)
Phase 3 (Stamp Officer)	212	181	Sufficient	40.18 (0:0:40.18)
Phase 4 (SPS Officer)	181	176	Sufficient	178,55 (0:02:59)
Phase 5 Data Entry	199	103	sufficient	46,23 (00:00:46,23)
Phase 6 (Verification Officer)	212	191,8	sufficient	110.47 (00:01:21,48)

From Table.1 above, it is obtained N > N' at each stage of the service so that it can be concluded that, theoretically suggested, the observational data have been qualified.

C. Simulation Model

With the help of software of Arena 14:00, the simulation model was built as in Figure 1.

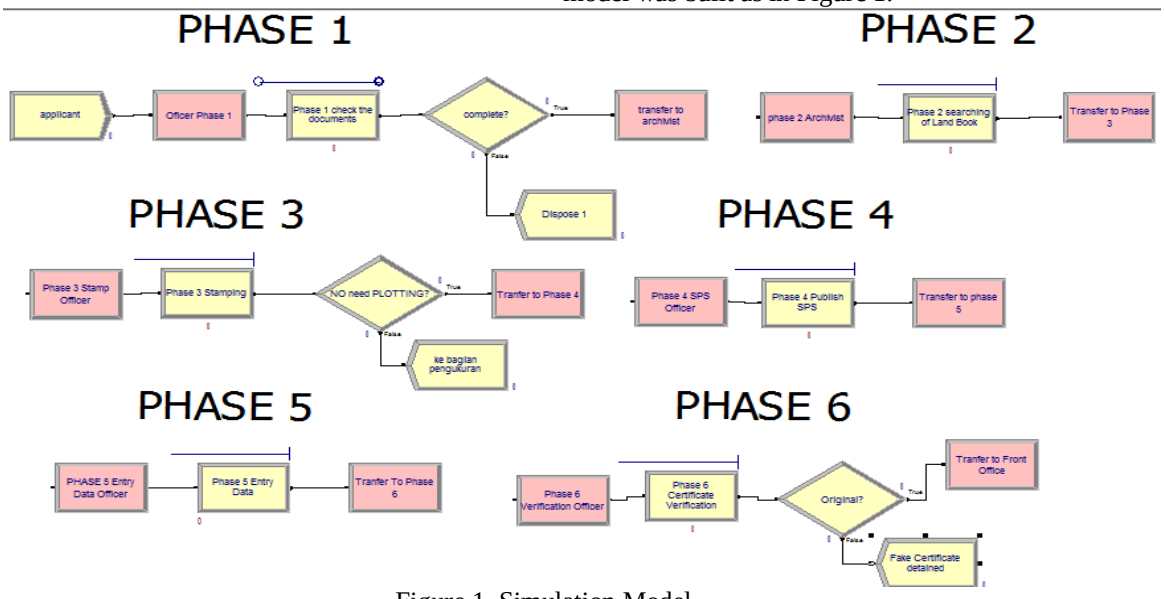

Figure 1. Simulation Model

Queue performance results of the simulation of the number of entry and exit form then were tested using T-test to prove that the simulation model has represented the existing condition of certificate service checking by Bogor District Land Registry Office (Sumarwoto & Marwani, 2012). T-test results can be seen in Table 2.

Table 2. T-test Results

	Input		Output	
	Simulation	Observation	Simulation	Observation
Mean	320.95	321.60	190.40	198.20
Variance	2238.68	16661.52	131.52	1021.96
Observations	20.00	20.00	20.00	20.00
Pearson Correlation	0.14		-0.15	
Hypothesized Mean Difference	0.00		0.00	
Df	19.00		19.00	
t Stat	-0.02		-0.98	
P(T<=t) one-tail	0.49		0.17	
t Critical one-tail	1.73		1.73	
P(T<=t) two-tail	0.98		0.34	
t Critical two-tail	2.09		2.09	

Calculation of the t-test for input data was done by value t-stat = -0.022 and t-table = 2,093. The test results show that the t-stat is between the value of (-2.093; 2,093). Then there is no difference between the data file and the existing entry simulation. From the output data, it was obtained that t-stat = -0.98 and the t-table = 2,093. The test results show that the t-stat is between the value of -2.093 and 2,093. From the output data, also there is no difference between the simulation data and the existing one. It can be concluded at the 95% confidence, interval on simulation models has to represent the existing condition of the certificate of service checks

From the simulation results with replication during the 20 days, measure performance of the queue was obtained as shown in Table 3.

Table 3. Results of simulation performance in certificate checking service queue

Performance	Minimum	average	maximum
Number of input	273 file	324 file	430 file
Number of output	169 file	186 file	217 file
in Process (WIP)	49 file	72 file	229 file
Waiting Time (minute)	60,138	83,784	253,938
Service Time (minute)	8,154	8,634	18,786
Transfer Time (minute	1,092	1,158	1,38
Total Time (minute)	69,594	93,756	263,454

From Table 3, it is shown that the number of incoming file is still greater than the number of out files that can be completed each day; the percentage of files that can be completed every day is 57.40 % of the incoming application. This results in a buildup of files on the following day. According to Iksan (2006), if the number of customers who come in is greater than the amount that comes out, the system cannot be said to be optimal.

D. Analysis of Waiting Time

At each stage, the service waiting time to do and the number of files existing queues can be seen in Table 4.

Table 4. The waiting time and the number of queues in each entity file at every stage of the simulation results service

Phase	Average Waiting time (hour)	Maximum Waiting time (hour)	Average Number of queue	Maximum Number of queue
Phase 1	0:00:40	0:13:28	0,409	31
Phase 2	0:46:08	2:45:47	33.34	156
Phase 3	0:00:04	0:01:19	0.03	1
Phase 4	1:07:40	2:46:17	33,58	88
Phase 5	0:00:11	0:00:32	0	1
Phase 6	0:00:20	0:07:13	0.11	3

From Table 5, we can see that the phases with the longest waiting time are Phase 4 and Phase 2. The highest number of the queues of files occurs in Phase 2, namely 33 files with maximum piles of 156 files. In Phase 4, the number of stacks of file queues is also quite a lot, that is, 34 files and maximum of 88 files. This may indicate that at Stage 4 and Stage 2, there is inefficiency in services that need to be reduced.

Bottleneck analysis

The capacity of the process is determined by the slowest series of activities in the process. Bottleneck is a situation where the performance or capacity of a system is limited by a component or resource (Khalafi & Raissi, 2014). Figure 3 illustrates a graph of queue length, waiting time, and utility workers.

E. Analysis of Utility Officer

Utility rates/resource use is also an important factor in the efficiency of a service. The utility rates show the value of the power to the server in a system. In Figure 2, we can see the level of utility of busiest workers.

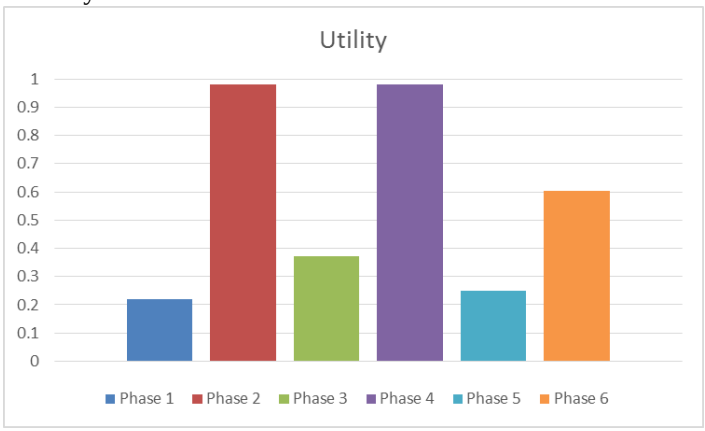

Figure 2. Utility level of workers

From the graph, it can be seen that the highest level of activity that officers have happens in Phase 4 at the utility level of 0.9814, or 98.14 % , and in Phase 2 that is equal to 98.11 % .

Determination of the tolerant limit of flurry refers to Ma'Arif and Hendri (2003) that for the best services, it is better to operate slightly below full capacity (50 < p < = 70 %). Therefore, the levels of utility workers who need to get improvement the most are Phase 2 and Phase 4.

F. Bottleneck analysis

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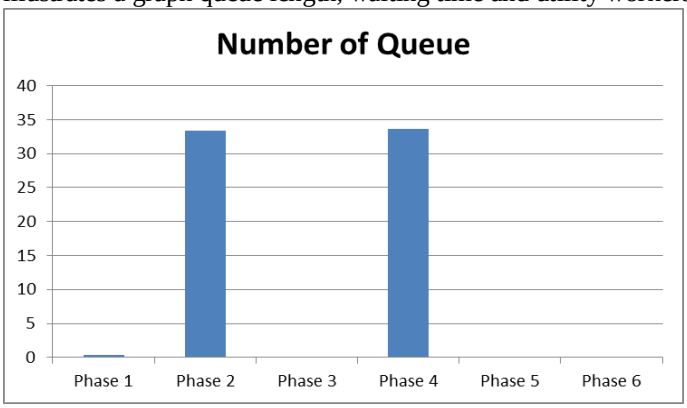

Figure 3. Number of queue

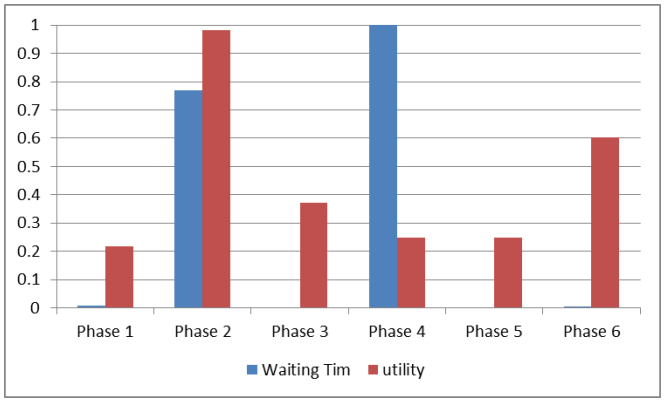

Figure 4. The Graph of the waiting time and the level of utility

From Figure 2 and 3, it can be concluded that the bottleneck on the certificate checking service activities are in Phase 2 of the land book search and Stage 4 is publishing SPS. The problem-solving approach of the production line is to fix the bottleneck at each station one by one starting with the station having the smallest output and longest service time (Abed, 2008).

F. Queue System Improvement

From the analysis of the waiting time, utility analysis, and bottleneck analysis, we concluded that the stages that need improvement are Phase 2 of the land book search and Phase 4 of the publication of SPS. Customers need excellent service that can generate loyal customers and improve customer satisfaction. One of the efforts is increasing satisfaction with the efficiency of the waiting time associated with a queue system that includes the speed of service and the number of applicants that can be served (Joni, Suryani, 2012).

Afrane and Appah 2014 the length of time patients wait an impact on patient satisfaction with care. hence the smaller the waiting time increased patient satisfaction. In line with Garcia D, Archer T, S Moradi, Ghiabi B (2012), the waiting time plays an important role in customer satisfaction.

Cernea (2010), queuing models play a major role in improving operational effectiveness. In general, in order to fix the used queue service time improvement approach it is possible to use one or both of the following solutions, namely by increasing the average service rate by redesigning queuing system or by adding new service channels so that customers can be served quickly.

There are five (5) scenarios developed in order to improve the queuing system. Scenarios are made to identify and determine the best system of proposals that could be applied. (Astuti, 2002). Model repair scenarios are presented in Table 5.

In Phase 2 of the archive search phase that requires hard skill in searching for archives, the improvements that can be done is to increase the number of officers. In Phase 4, namely the publication of SPS, the constraints due to length of time of service are slow Internet connection; therefore, the improvement made is to increase Internet speed in Phase 4.

After repairing in Phase 2 and Phase 4 as previously mentioned, there is congestion in Phase 6. Repairs are to be conducted on Stage 6. Stage 6 is an official verification of the implementation requires officers' soft skill ability to distinguish genuine or fake certificate. That is why, the necessary improvements in Phase 6 are providing an additional number of officers who have expertise and thoroughness in examining the authenticity of the certificate.

Table 5. Scenario improvement

Scenario	Phase in Services		
	Phase 2*	Phase 4**	Phase 6*
Existing	2	1	1
Scenario 1	2	2	1
Scenario 2	3	2	1
Scenario 3	3	3	2
Scenario 4	4	3	2
Scenario 5	4	4	2

Description:
*) Increasing the number of officers
**) Increasing internet speed

Explanation of each scenario are as follows:

1) The existing condition of service of checking certificates District Land Registry Office which consisted of 2 archivist, 1 official verification and 1 officer verifying the issuance of SPS. Internet speed in phase 4 is considered 1 (one) with an average service speed is 179 seconds.
2) Scenario 1 is the scenario improvement with the formation: 2 archivists; 1 official verification and increase the speed of the internet in Phase 4 to 2-fold. Which means that the speed of service at phase 4 increased to 89.5 sec/file.
3) Scenario 2 is the scenario where the number of archivist increased to 3, official verification remains 1 and the speed of service at the stage 4 is 2 times than the existing condition.
4) The improvement Scenario 3 is the scenario where the number of archivist is 3; verification officer increased to 2 people and the internet speed in Phase 4 increased to 3 times, which means that the speed of service at Phase 4 to 59.67 seconds.
5) Scenario 4 is the scenario where the number of archivist expanded to 4 people; official verification becomes 2 and the speed of the internet in Phase 4 is three-fold, with the speed of service at the phase 4 is 59.67 sec/file.
6) Scenario 5 is a repair scenario where the number of archivist expanded to 4 people; official verification becomes 2 and the speed of the internet in Phase 4 is 4-fold, with the speed of service at the stage of 4 to 44.75 sec / file.

The results of scenario repair for checking service activities are shown in Table 6 and Figure 5.

Table 6. Simulation performance results of each file of improvement scenario

Scenario	input	ouput	Service time (hour/file)	Total Time (hour/file)	Waiting Time (hour/file)	Number of WIP
existing	324	186.55	0.144	1.56	1.396	72.575
Scenario 1	324.5	252.75	0.15	0.892	0.721	38.899
Scenario 2	328.9	267.6	0.15	0.756	0.586	35.251
Scenario 3	325.9	308.95	0.152	0.346	0.174	15.798
Scenario 4	333.1	320.45	0.151	0.266	0.094	12.07
Scenario 5	346.8	331.9	0.153	0.278	0.105	13.556

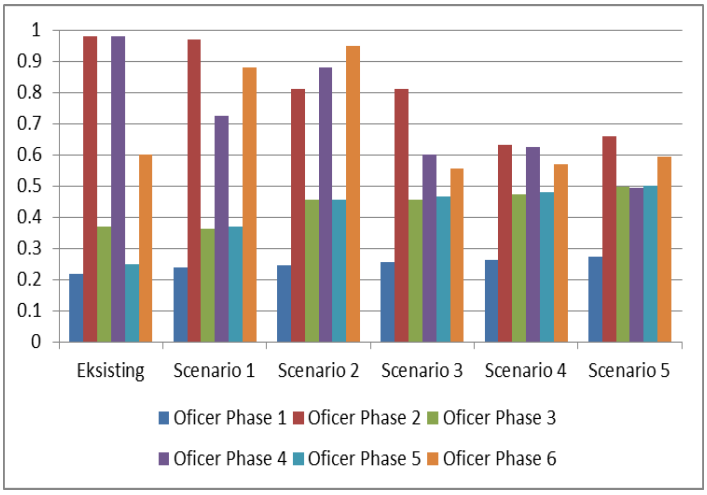

Figure 5. Graph utility level officer in each scenario

Based on simulation results, the best scenario is where the output file is in the optimal amount, the total time is less and the level of utility services officer does not exceed 70%; this occurs in the Scenario 4. Formations of officers in Scenario 4 are: the number of workers filing by 4 people, verification officials as much as 2 and increasing internet speed by 3 (three) times from the current speed.

For official verification, incidental increase in the number of servers is adjusted to the number of applications. Given the importance of the responsibility of the officer, the officer's verification certificate can be a verification officer from BPN employees who already have the skills to identify and separate the original certificate and the fake ones, especially for the old certificates that require more rigor in checking authenticity. Thus, it should be provided trained reserve officers with accuracy and expertise in checking certificates in Bogor District Land Registry Office to help examine the certificates.

IV. CONCLUSION

The existing condition of service of checking land titles in Bogor District Land Registry Office is already effective but still inefficient. The current service system of research still cannot meet the high public request for certificate checking service. The use of the queue number has not been optimal. It can lead to a decreased level of community satisfaction with services provided by Bogor District Land Registry Office.

From the simulation using Arena 14.00, the percentage of files that can be completed in every day at the existing condition is only 57.40% of the incoming beam. Of the six stages of the service, those which undergo stages bottleneck are Phase 2 of the archive search and Phase 4, which is publishing SPS.

Of the five development scenarios for service repair system, the best scenario would be Scenario 4, with the addition of the archivist to 4 people; increased internet speed to 3-fold and provide two officers of the internal certificate verification. This improvement scenario can boost the waiting time to become 0.278 hours from the previous of 1.56 hours. The amount of output increased to 96,20%. Yet, the wait In Process (WIP) file was still decreasing, from originally 73-209 files into 13 files. In addition archivist utility rates decreased from 98.11% to 63.2%. Utilities publisher officers SPS decreased from 98.11% to 62.6%. In conclusion, utility workers are expected to maintain service quality in checking of certificates.

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