Simulation of the Registration Systems for New Indonesian Computer University Students and Their Implications for Service Systems Process Performance

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Abstract. This study aims to analyze the registration systems for new UNIKOM students, and its implications for the level of utility registration service officer, expected number of units in the system, expected waiting time of an arrival and probability that there are 0 units in the system at a particular time. The method used is a quantitative method through continuous analysis of simulation. Simulation with changes in status from the simulation model occur at points of continuous time change by an event. In a continuous event simulation, the status variable changes if an event occurs along with a change in time. The object of this research is prospective students as a unit of analysis. The technique of collecting data uses saturated random sampling of applicant prospective students. The results of the registration systems process show a good level of expectation on the utility, the number of units in the system, location state single, the waiting time and output entity activity system, from the registration systems for new UNIKOM students. The next step is to continual improvement each service room with time, the number served is more effective and efficient so PMB service room becomes excellent.

1. Introduction.
Simulation is imitating the real process called a system with a model to understand how the system works. Computer simulation is a model evaluated numerically and data is collected to estimate the actual characteristics of the model. The model is a representation of the system that is determined by the purpose of the study of the system, a model is not just a substitute for a system, but a model is a simplification of a system. Instead the model must be sufficiently detailed to provide valid conclusions that can describe the system under review. Learning systems with simulations means numerically running the model by giving input and seeing its effect on output. A scientific model can be defined as an abstraction of some real system that can be used for purpose of prediction and control. The purpose of a scientific model is to enable the analyst to determine how one or more changes in aspects of a modeled system may affect other aspects of the system or the system as a whole. In order to be useful a scientific model must necessary embody elements of two conflicting attributes realism and simplicity. On one hand, the model should serve as a reasonably close approximation to the real system and incorporate most of the important aspects of the system. On the other hand, the model must not be so complex that it is impossible to understand and manipulate [1]. Process modelling and simulation is a widely employed in Operational Research (OR) and Management Science for helping to effect improvement in complex problem situations. However, simulation modelling generally lacks a rich body of literature reflecting on the process and practices of modelers in the real world [2]. The simulation model was developed based on the real time data, and the results were used to recommend changes in the systems for optimizing, scheduling and maximizing operational efficiency [3]. In contrast to the critical path technique or event process chains, Petri nets describe the dynamic behavior of systems, because they are
directly executable. In this case simulation and analysis algorithms can be applied. Analysis or simulation support to predict and optimize the performance of the modelled organization and its business processes [4].

Though there are a lot of industrial engineering tools including FMEA, PERT analysis and others, it has been widely accepted that simulation is one of the most commonly used approach for decision-making in the industrial organization [5]. The simulation model helped the company in optimizing labor utilization besides increasing quality, service, and value to the customer [6]. Computer based simulation being used as a vehicle for modeling and analysis in a wide number of application areas [7]. In the manufacturing industries, discrete-event simulation modeling and analysis often improve system robustness by helping engineers construct a better system through the elimination of bottlenecks, improvement of resources utilization, and optimization of system resources [8]. Strategic planning for airport design and operations is a challenging task, since it should consider a variety of alternative futures, their consequences for airport performance and possible strategies for ensuring that the airport meets its business objectives. Existing models and tools for quantifying airport performance require significant detailed data, substantial airport modelling effort and do not readily produce the information relevant to decision makers. Therefore, a fast and simple simulation model is needed that provides insight into the key performance indicators of an airport for different strategies across different futures [9]. Discrete event simulation is one of the most powerful tools available to the analysis of several problem domains; among them, logistic systems field [10]. The objectives of simulation are classified as performance analysis, capacity/constraint analysis, configuration comparison, optimization, sensitivity analysis and visualization [11].

This study aims to analyze the registration systems for new UNIKOM students, and its implications for the level of utility registration service officer, expected number of units in the system, expected waiting time of an arrival and probability that there are 0 units in the system at a particular time. The method used is a quantitative method through continuous analysis of simulation. Simulation with changes in status from the simulation model occur at points of continuous time change by an event. In a continuous event simulation, the status variable changes if an event occurs along with a change in time. The object of this research is prospective students as a unit of analysis.

2. Method
The research method used in this study, is through the process of observing the entity, namely prospective new students who register, and the process of service provided by PMB officers who are placed at the locate where the new student is admitted. So that the utility of each officer can be measured, the number of units in the system, the waiting time and probability of the system, from the registration systems for new UNIKOM students. The layout of service simulations can be seen in Figure 1.

![Figure 1. Layout registration system of the research 2019](image)

The technique of collecting data is done by sampling for the activities of prospective new students on the place UNIKOM registration system. Service Simulation at New Student Admission (PMB) UNIKOM Bandung needs a Service Simulation Model in the service of PMB UNIKOM Bandung where every day students and prospective new students (Customers) of the City of Bandung come to the service place of PMB
UNIKOM to carry out administration, registration and other interests, but because the PMB service only has 3 new service units working from 6 existing units, the customers must queue and wait at the waiting room at the PMB Lobby. The time interval between customer arrivals is exponentially distributed with an average of 30 minutes. While one service center person needs 30 minutes to serve every student and prospective new customer

3. Results and Discussion

The result of the data system simulation can be seen in Figure 2.

![Figure 2. Output layout registration system of the research 2019](image)

Based on the results of data system simulation model processing, the PMB UNIKOM new student registration for, the level of use of the registration service room, the average number in the system, the average waiting time in the system and the probability of no registrant waiting in the system that is shown in the Figure 3.

The level of utility of the registration service room, the average number in the system, the average waiting time in the system and the output of the entity activity system. Based on the results of the simulation model shows that:

3.1 Output Utility PMB Registration

The results of data processing can show, Scheduled Time (H.R), Capacity, Total Entries AVG, Time Per Entry (MIN), AVG Contents, Maximum Contents, and % Utilization. Table 1 shows the percentage of performance of each new student admission officer at PMB UNIKOM as for the presentation, namely:

a. Have a presentation from Scheduled Time (H.R) = 8.01 and Capacity = 100 so that the total Entries AVG: Service Room A = 96; Service Room B = 160; Service Room C = 120 means that based on the presentation, the total entry of each service room per day is very high.
b. Have a Time Per Entry (MIN) presentation: Service Room A = 4.04; Service Room B = 2.58%; Service Room C = 3.73% means that based on the presentation it shows a very fast Time Per Entry (MIN) so that the officers of each service room must serve quickly and good.
c. Have a AVG Contents presentation: Service Room A = 0.81; Service Room B = 0.86%; Service Room C = 0.93% of Maximum Contents means that based on the presentation, the AVG Contents show that the Maximum Contents are close to each service room in serving quickly and precisely.
d. Have a presentation% Utilization: Service Room A = 80.63%; Service Room B = 85.73%; Service Room C = 93.05% means that based on the presentation, it shows a very high% Utilization, and for the highest service room is service room C in serving quickly and precisely.

| Name            | Scheduled Time | Capacity | Total Entries | Avg Time Per Entry | Avg Contents | Maximu m Contents | % Utilization |
|-----------------|----------------|----------|---------------|--------------------|--------------|--------------------|---------------|
| Line 1          | 8.01           | 100.     | 96            | 1.03               | 0.21         | 1.00               | 1.77          |
| Line 2          | 8.01           | 100.     | 160           | 0.58               | 0.19         | 1.00               | 2.78          |
| Line 3          | 8.01           | 100.     | 120           | 0.73               | 0.18         | 1.00               | 2.15          |
| Service Room A  | 8.01           | 100.     | 96            | 4.04               | 0.81         | 1.00               | 80.63         |
| Service Room B  | 8.01           | 100.     | 160           | 2.58               | 0.86         | 1.00               | 85.73         |
| Service Room C  | 8.01           | 100.     | 120           | 3.73               | 0.93         | 1.00               | 93.05         |
| Check           | 8.01           | 10.      | 0.0           | 0.00               | 0.00         | 0.00               | 0.00          |
| Administration  | 8.01           | 100.     | 748           | 1.31               | 2.05         | 4.00               | 2.05          |
| Worker          | 8.01           | 100.     | 0.0           | 0.00               | 0.00         | 0.00               | 0.00          |
| Inspector       | 8.01           | 100.     | 0.0           | 0.00               | 0.00         | 0.00               | 0.00          |
| Inspector2      | 8.01           | 100.     | 0.0           | 0.00               | 0.00         | 0.00               | 0.00          |
| Table           | 8.01           | 100.     | 0.0           | 0.00               | 0.00         | 0.00               | 0.00          |

3.2 Output entity activity

Entity Activity is an activity or activities carried out by all entities while in the system. While the entity itself is something that becomes the object of a process, namely the customer. Table 2 shows an entity activity. If it is seen during the simulation, it runs 8 hours, the number of customers who come is unlimited and the system that comes out is 373 people. When the simulation is complete, there are still 3 people in the system. The average time spent by an entity in the system is 5.95 minutes, meaning the time needed by a customer since entering the queue until the service provided to him is completed. While the average time for the entity to wait 0.00 minutes means the time needed by the customer since entering the queue to get service, but not including service time. With an average motion time of 3.32 minutes, operating time is 2.64 minutes, and with a holding time of 0.00 minutes because the active entity moves where the simulation time has run out.