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Analyzing Outpatient Department Performance using ARENA Simulation: A Case Study

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Many public hospitals in Sri Lanka are becoming overcrowded and creating long waiting queues at their outpatient departments. Thus, they have faced the challenge of managing patients at their public health clinics and providing an effective service. Also, the patients become frustrated and make many complaints on the dissatisfied service. Therefore, this study identified the problem of unnecessary queuing in the selected public hospital. The investigations were done aiming to improve the performance of the department through probable solutions. Though the observed hospital had assigned eight doctors in the outpatient department, this study selected only two doctors considering the convenience of data collection. Then, the model was analyzed as a multi-server queuing system with infinite waiting room capacity and infinite population. The observations were recorded for patients' arrivals to the queues at ticketing counter and service provisions of the two doctors in a one hour period of each for two days. The sample included 150 patients. Then the system was modeled using the student version of Rockwell ARENA 14.5. Moreover, the assumptions were made on arrivals to be random and independent. The service discipline was considered as First-In-First-Out. The Input Analyzer showed BETA distribution for all inter arrivals and service provisions. These results were used to define the modules chosen from both basic process and advanced transfer panels of ARENA. The model was simulated and obtained results for the respective average waiting times of patients in the queues at the ticketing counter, doctor 1 and doctor 2 as 4.82, 34.99 and 26.82 minutes. Furthermore, those values for the patients in the system were correspondingly 90.29, 104.97 and 182.22 minutes. Thus, the problem identified in the study was evident in the selected system emphasizing the necessity of improving the performance of the outpatient department. The study suggested to double the resources in the ticketing counter. The proposed model was then simulated and obtained reduced waiting times in the queues at ticketing counter, doctor 1 and doctor 2 respectively to be 0.64, 26.73 and 14.52 minutes. Further, the resource utilizations could be increased by 24%, 5% and 12% respectively to the above three observations. Therefore, the proposed model can be implemented in the outpatient department of the selected hospital to further improve its performance considering the financial feasibility.

Keywords: Modeling and Simulation with ARENA, Multi Server Queuing System, Performance of an Outpatient Department