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Multi-server queuing system modeling approach for customer service management in a super market: A case study

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The service performance is a key determinant for a super market to win customer attraction in large scale. Thus, better performance can be ensured with an efficient service provision to its customers. Accordingly, the study found a renowned supermarket forming long waiting times at its counters and motivated to find solutions for that queuing problem. Therefore, this investigation aimed to analyze the performance of the existing system and provide further improvements to it. This queuing problem was significant there in weekends. Thus the data were collected observing the system from 9.30 am to 12.00 noon in one Saturday. The study recorded customer arrival and service provision times. The sample size was 100 observations. Then the system was modeled and simulated using the student version of Rockwell ARENA 14.5. The study assumed customer arrivals to be random and independent, servers to be identical, no shift changes and breaks for cashiers in the observation period and service discipline to be First In First Out. The data were collected only for three counters considering the recording convenience. Therefore, the system was identified as a multi-server queuing system with infinite waiting room capacity and infinite population. The Input Analyzer showed inter-arrivals to be normally distributed. Also, the service provisions at both counter 1and 2 showed triangular distribution and that of counter 3 showed normal distribution. The system was then modeled using the ARENA modules in both basic process and advanced transfer panels and was run for three hours replication length. The results revealed the service rate of the super market as 76.63%. Furthermore, the average waiting times in the queues at counter 1, 2 and 3 were respectively 16.16, 16.67 and 16.51 minutes and the number waiting were correspondingly 1.62, 1.72 and 1.93. Also, a customer had to spend 21 minutes of average time in the queuing system. Thus, the study made evidence for long waiting times in the queues. Therefore, the super market needed to improve its performance to provide a better satisfaction for their customers. The study emphasized the necessity of trained and efficient cashiers at the counters recommending to provide further training to them and assign helpers to pack goods separately to the counters. In advanced, the cashiers can be facilitated with more sophisticated equipment to do payment transactions.

Keywords: Customer management, Modeling with ARENA, Performance analysis, Simulation of queuing systems, Super market queues