

An Analysis of Service Flow in a Higher Education Cafeteria in Colombo Using Queuing Theory

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Abstract

Queuing is the inevitable aspect of our day-to-day life, occurring whenever the demand for relevant service exceeds the capacity or the speed of available servers. The Queuing theory provides a systematic framework to analyse such situations, enabling the design of efficient and effective service systems that minimise the waiting times while optimising the resource utilisation. This study applies the queuing theory to investigate the waiting line dynamics at a university cafeteria in Colombo, Sri Lanka, during peak hours on Sundays. Data was collected through a direct observation approach over two separate Sundays, focusing on the breakfast rush (10:00–10:30) and the lunch peak (12:15–12:45), both operating with the same number of cashiers and servers. Using the Microsoft Excel-based M/M/1 simulation model for preliminary statistical analysis and the Any Logic simulation software for dynamic modelling, we examined the arrival rates, service times, and system performance under varying demand conditions. The results indeed revealed notable differences in arrival patterns and the average queue lengths between breakfast and the lunch sessions, with the lunch showing higher arrival intensity and longer wait times. On Day 01, the average waiting time was 63.05 seconds in the morning and 79.81 seconds at lunch, while on Day 02 it increased to 102.31 seconds in the morning and 162.42 seconds at lunch. The simulation experiments further explored the potential improvements, including adjusted staffing levels, effective serving strategies, and the optimised service time distribution. By combining real-world data with the simulation-based modelling, this research not only highlights the applicability of queuing theory to the real-world service environments but also indeed provides practical recommendations to enhance efficiency in the cafeteria operations. This research finding shows simulating cafeteria data using Any logic can be used to improve service quality.

Keywords: Any Logic Modeling, cafeteria operations, queuing theory