Report: Checkout Process Simulation for a Small Gift Shop

1. Introduction

This report presents the results of a simulation conducted to analyze the checkout process at a small e-commerce store, such as a gift shop. The two key performance measures investigated were:

The average time a customer spends in the system (waiting and being served).

The percentage of time the checkout clerk is idle.

The simulation assumes one cashier and one line of customers waiting for service.

2. Methodology

The simulation was based on the following assumptions:

Interarrival Times: The time between customer arrivals is uniformly distributed between 1 and 15 minutes, rounded to the nearest minute.

Service Times: The time required to service each customer is uniformly distributed between 1 and 8 minutes, also rounded to the nearest minute.

A total of 20 customers were simulated. Key variables such as arrival times, service start and end times, and customer time in the system were calculated based on these assumptions. The simulation was conducted using the following methodology:

1.Interarrival Time and Service Time Generation:

Interarrival times were randomly generated for each customer using a uniform distribution between 1 and 15 minutes.

Service times were also randomly generated using a uniform distribution between 1 and 8 minutes.

2.Service Start and End Times:

The service start time for each customer was determined based on the later of their arrival time or the end time of the previous customer’s service.

The service end time was calculated as the sum of the service start time and the service time.

3.Performance Measures:

Average Time in the System (W): Calculated as the average of the time each customer spent from arrival to the end of service.

Idle Time Percentage: Calculated as the proportion of time the cashier was idle (i.e., the difference between customer arrival and the end of the previous service) compared to the total simulation time.

3. Results

The key findings from the simulation are as follows:

Average Time in the System (W):

On average, each customer spent 4.5 minutes in the system, including both waiting and service time.

Idle Time Percentage:

The cashier was idle for 45.12%of the total simulated time, indicating a significant portion of time where the cashier was not engaged in serving customers.

4. Conclusion

The simulation provided insights into the performance of the checkout system. The average customer time in the system was relatively low at 4.5 minutes, suggesting a reasonably efficient process for handling customer transactions. However, the high percentage of idle time (45.12%) highlights that there are periods when the cashier is underutilized. This could point to an opportunity to optimize customer flow or better allocate resources during less busy times.

The methodology used in this simulation can be applied to similar contexts in other retail environments to identify areas for operational improvement.