**Simulation Report**

Introduction.

This report summarizes the results of a simulation conducted to analyze the checkout process in a small e-commerce store. The objective was to determine key performance measures, including the average time a customer spends in the system and the percentage of time the checkout clerk is idle. The simulation was carried out over a period of 3 hours with 20 customers, and 50 replications were generated using MS Excel’s Data Table feature.

Methodology

Simulation Setup

Model Configuration

Interarrival Times: The time between customer arrivals is uniformly distributed between 1 and 15 minutes.

Service Times: The time required to service each customer is uniformly distributed between 1 and 8 minutes.

Simulation Duration: 3 hours (180 minutes).

2. Spreadsheet Structure:

i) Columns:

Customer Number: Sequential number of customers.

Interarrival Time: Randomly generated time between arrivals.

Arrival Time: Cumulative time of arrival for each customer.

Service Time: Randomly generated service time for each customer.

Start Service Time: Time when the customer starts being serviced.

End Service Time: Time when the customer finishes being serviced.

Time in System: Total time each customer spends in the system.

Idle Time: Time the cashier is idle between customers.

ii)Calculations:

Average Time in System : Calculated as the average of the time in system for all customers.

Proportion of Idle Time: Calculated as the total idle time divided by the total time observed.

3. Simulation Process:

- The simulation was run for 20 customers with arrival and service times randomly generated.

- The end service time for each customer was capped at 180 minutes to fit within the 3-hour window.

- Excel’s Data Table feature was used to generate 50 replications of the simulation.

2.2 Data Table Implementation

1. Setup:

- A replication counter was created, listing numbers from 1 to 50.

- Cells were linked to the simulation template to pull results for average time in system and proportion of idle time.

2. Execution:

- The Data Table feature was utilized to automate the generation of 50 replications, filling in results based on the simulation template.

3. Results

3.1 Summary Statistics

- Average Customer Time in the System: This metric represents the mean time a customer spends in the checkout process, including both waiting and service times.

- Proportion of Idle Time: This percentage indicates the amount of time the cashier was not actively serving customers. It is derived from the total idle time relative to the total time observed during the simulation.

3.2 Results Overview

- Average Time in System: The average time each customer spent in the system across all replications.

- Proportion of Idle Time: The average percentage of time the checkout clerk was idle across all replications.

3.3 Analysis

- Customer Time in System: The results provide insight into the efficiency of the checkout process, reflecting both service speed and customer wait times.

- Server Utilization: Understanding the proportion of idle time helps evaluate the efficiency of resource utilization and identifies potential improvements in service scheduling.

4. Conclusion

The simulation of the checkout process revealed critical performance metrics that can inform operational decisions. By analyzing 50 replications, the study provided a robust understanding of customer wait times and cashier idle periods. This information is valuable for optimizing checkout processes and improving overall customer satisfaction in an e-commerce environment.

5. Recommendations

-Optimize Service Times: Consider strategies to reduce service times and improve overall customer throughput.

- Reduce Idle Time: Explore ways to better align cashier schedules with customer arrivals to minimize idle time.

This report summarizes the methodology and results of the checkout simulation and offers insights into process improvements based on the analyzed data.