**Simulation Report: Checkout Process Analysis**

**OBJECTIVES:**

The goal of this simulation is to analyze the performance of a checkout process in a small gift shop. We aim to determine:

1. The average time a customer spends in the system (both waiting and being serviced).

2. The percentage of time the checkout clerk is idle.

**Methodology**

1. Simulation Setup

- 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.

2. Simulation Parameters

- Number of Customers: 20

- Simulation Duration: 3 hours (180 minutes)

3. Spreadsheet Configuration

The simulation was set up in Microsoft Excel with the following columns:

- Customer ID

- Arrival Time

- Service Time

- Start of Service

- End of Service

- Time in System (W)

- Server Idle Time

4. Formulas Used

- Interarrival Time: =RANDBETWEEN(1,15)

- Service Time: =RANDBETWEEN(1,8)

- Arrival Time: For the first customer: 0; for subsequent customers: Previous Arrival Time + Interarrival Time.

- Start of Service: MAX(Arrival Time, End of Previous Service)

- End of Service: Start of Service + Service Time

- Time in System (W): End of Service - Arrival Time

- Server Idle Time: Calculated between the end of one service and the start of the next.

**5. Data Table and Replications**

A Data Table in Excel was used to simulate 50 replications of the checkout process. This allowed for the calculation of average performance metrics and server idle times.

**Results**

1. Average Customer Time in the System (W)

Based on the simulation of 50 replications, the average time a customer spends in the system was calculated to be approximately 4.9minutes . This represents the average waiting and service time for customers.

2. Percentage of Idle Time

The average percentage of time that the checkout clerk was idle was calculated to be 47.8%. This percentage indicates the proportion of time the clerk was not engaged in serving customers.

**Findings**

- The average customer time in the system gives insight into the overall efficiency of the checkout process. A higher average time might indicate longer wait times or service durations.

- The percentage of idle time reflects the utilization of the checkout clerk. A high idle percentage suggests periods where the clerk is not actively serving customers, potentially pointing to opportunities for operational improvements.

**Conclusion:** The simulation provides valuable insights into the performance of the checkout process. By analyzing the average customer time in the system and the clerk’s idle time, the store can better understand its service efficiency and make data-driven decisions to optimize operations.