Methodology on E-commerce Checkout SimulationObjective:The primary goal of this simulation was to evaluate two key performance metrics in the checkout process of an e-commerce store:Average time a customer spends in the system (including both waiting and receiving assistance).Percentage of time the cashier remains idle.

Assumptions:Interarrival Times: Uniformly distributed between 1 and 15 minutes.Service Times: Uniformly distributed between 1 and 8 minutes.The simulation was conducted over a period of 3 hours (180 minutes) and included a total of 20 customers.

Methodology:Customer Data Generation:Random interarrival times and service times were generated using Excel’s RANDBETWEEN() function:Interarrival time: =RANDBETWEEN(1, 15)Service time: =RANDBETWEEN(1, 8)

Arrival Time:Formula: The arrival time for each customer is calculated as the cumulative sum of interarrival times.For the first customer: =B2 (Interarrival time in cell B2)For subsequent customers: =C2 + B3 (Previous customer’s arrival time + interarrival time for the current customer)

Service Start Time:Formula: The service for the first customer starts at their arrival time.For the first customer: =C2For subsequent customers, service starts when the customer arrives or when the cashier finishes serving the prior customer, whichever is later:=MAX(C3, F2) (Maximum of the current customer's arrival time and the previous customer’s service end time)

Service End Time:Formula: The service end time is calculated by adding the service start time and service time.=D2 + E2 (Service start time + service time)Performance Metrics: Time in System:Formula: The total time a customer spends in the system is the difference between the service end time and the arrival time.=F2 - C2 (Service end time - Arrival time)

Idle Time:Formula: For the first customer, the idle time is 0. For subsequent customers, it is calculated as the gap between the previous customer's service end time and the current customer's service start time.For the first customer: =0For subsequent customers: =MAX(0,E3-F2) (Current customer's service start time - Previous customer’s service end time)

Replication:To capture variability, the simulation was replicated 50 times using Excel’s Data Table feature.A random set of interarrival and service times was generated for each replication, allowing the analysis of multiple scenarios.

Findings:Average System Time:Over the 50 replications, the average time customers spent in the system was calculated by averaging the results from the "Time in System" column.

Idle Time Percentage:After 50 replications, the average percentage of time the cashier was idle was determined by calculating the ratio of total idle time to the total simulation time (3 hours) for each replication and then averaging the results.

Summary:The simulation successfully provided insights into the e-commerce checkout process, including the average customer wait times and the percentage of time the cashier was idle. These results offer valuable information for improving the efficiency of the checkout system.