Grocery Store Checkout Queue Analysis

EEX5362 Performance Modelling

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# Problem Statement

The main problem is to optimize the checkout process at a high-volume grocery store to minimize customer waiting time and maximize cashier efficiency. Some current Systems leads to customer dissatisfaction during peak evening hours due to unpredictable and long waiting times, indicating huge performance bottlenecks in queue management and also in resource allocation.

# System Description

System Name : Grocery store checkout system

System Components:

* Customers: people who are waiting in the queue
* Service Lane Type:
  + Traditional (for more than 10 items)
  + Express (for less than 10 items)

System Behavior

* Normal hours: Normal hours that can predict how many customers come per minute
* Rush hours: Extreme number of Customers come and buy random items counts at the same time

# Data Set Description

**System Details**

* Session Duration: 2pm - 8pm
* Service Lane count: 2
* Total customers: 180
* Peak Hours: 5pm – 7pm

**Data Details**

The dataset will include the following measurable variables

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **customer ID** | **Arrival Time** | **Items Count** | **Service Lane Type** | **Start Service Time** | **End Service Time** | **Wait Time**  **(Calculated)** | **Service Time (Calculated)** |
|  |  |  |  |  |  |  |  |

* **Customer ID**: A unique number assigned to each person or shopping trip for tracking.
* **Arrival Time**: The exact time the customer joins the back of a checkout line.
* **Items Count**: The total number of products the customer bought.
* **Service Lane Type**: The kind of checkout line the customer uses (e.g., Traditional, Express).
* **Start Service Time**: The exact time the customer begins their transaction with the cashier (when they leave the waiting queue).
* **End Service Time**: The exact time the customer finishes paying and leaves the checkout area.
* **Wait Time (Calculated):** The total time the customer spent standing in the queue, waiting for a cashier to become free.
* **Service Time (Calculated):** The total time the cashier spent actively processing the customer's order (from start to end of service).

# Performance Objectives

* Minimize customer waiting time
* Improve cashier efficiency and workload balance.
* Reduce queue length variability
* Identify peak-hour bottlenecks
* Suggest process improvements techniques

# Reference

Git-repo: [madhuhansa/Grocery-store-checkout-queue-analysis](https://github.com/madhuhansa/Grocery-store-checkout-queue-analysis)