Simulation Consulting Proposal for *WallyBrew2.0®*

The owners of *WallyBrew1.0®* are proud to announce their next-generation coffee shop *WallyBrew2.0®*. You have been hired to study the existing operation of *WallyBrew1.0®* and suggest operational changes for a new and improved *WallyBrew2.0®*. This project has two components:

Component #1: Analysis of *WallyBrew1.0®*.

Using the code we developed in class, please determine the following (please give a 95% confidence interval for each).

1. What is the average waiting time for a customer (from entering to departing)?
2. On average how many total customers are served in a day?
3. On average how many customers are lost to having the line too long?
4. How often will the barista need to work overtime to serve customers past closing time?

Component #2: Proposal for *WallyBrew2.0®*.

The owners of *WallyBrew2.0®* are committed to improving the customer experience. Your task is to propose a new operating structure for the establishment. Your group will design a simulation to study the potential benefits of a different queuing system. In particular, you should provide a direct comparison between the 4 questions above for *WallyBrew1.0®* and the proposed *WallyBrew2.0®*. Your group should choose a set-up similar to the following options:

(1) Opening another service line in series with the existing one. The first station collects the money from the customer, and the second station fulfills the the order to the customer. The owners of *WallyBrew2.0®* expect that this will speed up the overall service time since the average service time of the first window is about 1 minute and the average service time of the second window is about 30 seconds. You will need to choose an appropriate distribution for these service times.

(2) Opening another service line in parallel. Here two separate lines are formed, each operating essentially as in the original configuration. Here when customers arrive, they choose the shorter of the two lines, but if the lines look the same, the entering customer randomly chooses one of the lines. As before, each line will only have at maximum 5 customers in it and if both queues have 5 customers, then the potential customer is lost.

(3) Creating a self-serve app, where customers who choose to place their order online can simply pick up their order with very little service time. They will still need to wait in line, but can receive their order in approximately 30 seconds instead of the typical 2 minute average service time. We estimate that about 30% of the customers will use this feature, while the other 70% will operate as in *WallyBrew1.0®*. There will still be a 5 customer max, but those who place an order from the app will need to wait until a space is available to be able to enter the business.

(4) A design of your choice, which may be similar to one of the options above if you want. You should describe your set-up in detail and justify any assumptions you make. If your group chooses this option, please have the details approved in your proposal before beginning your work in earnest.

You are hired to set-up your simulation and thoroughly analyze the operation of it. You should compare the existing system to the alternative you propose and include anything you deem potentially relevant to the owners, especially with respect to how they can make positive changes to how their business is run. Please form your group of three consultants and choose a queuing system to analyze.

Deliverables: :

- Your estimates of the 4 questions for the current operation of *WallyBrew1.0*®. This will be submitted as a hardcopy in class on **Wed, Mar 27**. Please submit one document per group.
- A short proposal with your group members that describes the scenario you're analyzing. This should clearly describe the structure of the queue that you are using and it should give details on your modeling choices (i.e., distributions for arrival and/or service times, etc.) **Due Fri, Mar 29 at the beginning of class.** Please submit one document per group.
- A written report that gives details on the scenario you studied, the modeling choices you made in setting up the simulation procedure, and a summary of your results. This report should be no longer than 3 pages. General guidelines are below. **Due Wed, Apr 3 as a hardcopy.**. Please submit one document per group.
    1. Your intended audience is the management team of *WallyBrew2.0*® and their operating engineers. (In other words, you may use technical explanations.) You should completely describe the assumptions that create your model and how the overall simulation works.
    2. You should use either Word or Latex and observe all rules of grammar, punctuation, consistent verb tenses, etc. Graphs and plots should be labeled and explained fully in the context of the report.
    3. Your statistical analysis should include appropriate error ranges at the 95% confidence level.
    4. You should clearly compare your results to the existing operation of *WallyBrew2.0*® . They will be most interested in knowing in which ways the proposed scenario improves upon the existing set-up.
- Submit your code to Canvas. The code should be organized and readable. Please make use of comments and text cells. **Due Wed, Apr 3 on Canvas.** Please submit one file per group.

Stochastic Simulation
Analysis of *WallyBrew1.0*®
Wed, Mar 27

Names: _____ _____ _____

Component #1: Analysis of *WallyBrew1.0*®.

Using the code we developed in class, please determine the following (please give a 95% confidence interval for each).

1. What is the average waiting time for a customer (from entering to departing)?

2. On average how many total customers are served in a day?

3. On average how many customers are lost to having the line too long?

4. How often will the barista need to work overtime to serve customers past closing time?