Part 2 - Experiment and metrics design

The neighboring cities of Gotham and Metropolis have complementary circadian rhythms: on weekdays, Ultimate Gotham is most active at night, and Ultimate Metropolis is most active during the day. On weekends, there is reasonable activity in both cities.

However, a toll bridge, with a two-way toll, between the two cities causes driver partners to tend to be exclusive to each city. The Ultimate managers of city operations for the two cities have proposed an experiment to encourage driver partners to be available in both cities, by reimbursing all toll costs.

1. What would you choose as the key measure of success of this experiment in encouraging driver partners to serve both cities, and why would you choose this metric?

I believe a metric that would measure the proportion of time spent in the two cities would be able to determine the success of the experiment. Our ideal situation is that driver partners no longer have a preference for which city they make trips in, with the toll situation being removed. Companies like Uber and Lyft collect data on their driver locations, which should allow them to determine what proportion of time they spend in Gotham vs. Metropolis.

However, then we must differentiate between weekdays and weekends. Because the two cities have different times of day during which they're active, we expect that drivers from Metropolis will not get many rider requests during the day from Gotham, and vice versa that drivers from Gotham will not get many rider requests during the night from Metropolis. Therefore, drivers from Metropolis and Gotham will be driving around in their respective cities for most of the time on weekdays.

However, because activity is roughly constant during the weekends, we can then expect that on average the drivers will be spending about the same amount of in both cities on weekends. So, we will primarily be interested on how the drivers driving patterns change during the weekend compared to during the week. Therefore, the metric I would ultimately go with is:

"proportion of time spent in both cities on weekends"

2. Describe a practical experiment you would design to compare the effectiveness of the proposed change in relation to the key measure of success. Please provide details on:

a. how you will implement the experiment

After the policy of toll reimbursements pass, I will simply see if drivers start driving in the other city more often on weekends.

b. what statistical test(s) you will conduct to verify the significance of the observation

I will compare the proportion of time drivers spend in both cities before the toll reimbursement policy and after. I would use hypothesis testing to know if the toll reimbursement is having a significant enough of an effect that it encourages and results in drivers driving to the other city more often.

c. how you would interpret the results and provide recommendations to the city operations team along with any caveats.

Based on the results of the hypothesis testing, I would be able to tell city operations if their toll reimbursement policy is successful or not.