

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?
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:
 1. how you will implement the experiment
 2. what statistical test(s) you will conduct to verify the significance of the observation
 3. how you would interpret the results and provide recommendations to the city operations team along with any caveats.

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?

The key metric would be to increase the revenue for ultimate. If by encouraging drivers from Gotham to move to Metropolis, we can bring down the surge pricing and thereby encourage more riders to book a ride, then revenue might increase. But due to the toll addition, drivers may behave irrationally since they do not want to pay toll and move to another city to balance out the demand supply problem.

So we first need to see the percentage of existing drivers who are crossing the bridge to service other city when they have to pay a toll with a high confidence and compare this with percentage of drivers who cross the bridge when the toll is paid by ultimate and see if it really helps balance out the temporary demand supply problem.

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

As explained above we first need to estimate with high confidence the percentage of drivers who cross the toll bridge when ultimate is not paying their tolls and then estimate estimate with high confidence the percentage of drivers who cross the toll bridge when ultimate is paying their tolls.

Given ultimate already has an app to communicate with drivers, implementing this test will not be a big problem.

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

I would conduct a hypothesis test comparing the percentage of drivers who would cross the toll bridge and go to another city during the times of surge with no toll paid by ultimate and toll paid by ultimate. With my null hypothesis being there is no increase in the driver crossing the toll gate during surge times.

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

If there is an increase in number of drivers moving to the other city where surge is high, then it would be effective to pay the toll by ultimate and thereby increasing the revenue of the company. Otherwise, company expenditures will increase with no new revenue addition which would lead to decline in the existing revenue.