Part 2: Experiment and Metrics Design

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?

It is a fact that the final goal of Ultimate is maximizing revenue/benefit. We can attain this goal by creating a balanced demand in both cities. Here in this case, we are assuming that the two cities have an imbalanced demand. Had they had balanced demand, there wouldn't have been a need for crossing the toll at all. Hence, in order to keep this equilibrium, drivers should cross from the city with less demand to the city with high demand. Therefore, the best metric for this problem is the proportion of drivers who cross from the city with less demand to the city with high demand. First, we will measure this proportion while Ultimate is not paying the toll and then we measure the same proportion while Ultimate is paying the toll. We would get a positive result if the latter proportion is significantly higher than the former one.

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***

The implementation of this solution would be very simple since Ultimate have an application that records all the necessary information for the estimation of the change in proportion.

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

Hypothesis testing comes in handy. Thus, our null hypothesis would be the proportion of drivers who cross from the city with less demand to the city with high demand while Ultimate is reimbursing; is the same as the proportion while Ultimate is not reimbursing. And our alternative hypothesis would be the proportion while Ultimate is reimbursing is greater than the proportion while Ultimate is not reimbursing.

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

On the one hand, if our null hypothesis is rejected after doing hypothesis testing, we would accept our null hypothesis. This means that there is a significant difference in proportion between the two that reimbursing toll costs has a positive impact in improving the proportion of drivers who cross from the city with less demand to the city with high demand. However, this wouldn't be the only thing that we should consider. We must check whether the difference is large or small that if it is small Ultimate must consider some other additional mechanisms that can motivate the drivers and consequently improve the proportion. On top of that, I would suggest that Ultimate must do a cost benefit analysis because spending too much money for a small change could be worthless.

On the other hand, if our null hypothesis is accepted, it implies that there is no difference in proportion before and after the intervention (reimbursing in this case). This indicates that reimbursing all toll costs has no impact in motivating drivers to cross from the city with less

demand to the city with high demand. In this case, I would recommend Ultimate to conduct further research to figure out the factors that are impeding drivers from crossing the bridge while their toll fee is being reimbursed.

NB: I didn't consider many other factors such as competitors, financial capacity of Ultimate...etc. for my conclusion and recommendation as I don't have much information about these factors.