The Drivetrain Approach to Decision Making
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Part I. Decision Memo for Bird Rides, Inc.

To: Mr. Bird

Subject: A way to increase the profit for your company

Summary

To **maximize the profit** of your company, this memo utilizes the drivetrain model to propose a series of steps Bird Rides should take to generate better financial strategies. The following analysis focuses on the optimal salary solution for the scooter chargers. By deciding core objective, recognizing levers we should adjust, choosing data we should collect, and generating possible models with the data, this memo will instruct you step by step to find out a prioritization scheme, which helps Bird Rides to become more successful.

Problem and Objective

Bird Rides need chargers to charge scooters at night, but the way to pay them remains lots of possibilities. It is hard to decide how many people to recruit, how much to pay them and how many scooters they should charge. If working out a payment proposal casually without analyzing, it may take lots of unnecessary money. As a business company, the objective should be **maximizing the net profit**. Therefore, we should make the best payment scheme.

Levers

To attain our goal, the company should pay the minimal money in the process of charging scooters. Therefore, the question is how to decrease the net salary expenditure while the total workload of charging scooters has been decided. There are two things the company can adjust to attain bigger gains: the number of chargers recruited and the salary calculating formula. To be more specific, the salary calculating formula decides how many scooters a charger charges every day and their deserved money. With the number of scooters they charge, the company will understand the number of people to recruit. Therefore, we need to understand the relationship between the payment to chargers and the scooters they can charge at first, and then combine the number of chargers we have to recruit to calculate the net expenditure, which we plan to minimize.

Data

To understand the relationship between the payment to chargers and the scooters they can charge, we have multiple data to collect. To begin with, we need to check the current payment state and analyze existing data about the normal range of scooters the chargers can charge during their working time.

Then, based on the number, we can develop some models and further collect data we don't have yet. For example, assume that a charger can charge 30-50 scooters every night and a fluctuation depends on their working desire and the distribution of scooters they need to charge. We infer that they will charge more chargers when they are paid more. To get their performance under different salary conditions, we need to try various payment strategies with various amount of payment.

More specifically, payment strategies include $50/day to charge 40 scooters, with $1 penalty for each scooter not charged; $20/day to charge 20 scooters, with $1.5 reward for each more; $1.1 for each scooter charged, and so on. Various amount means we can change the amount of reward and penalty to observe their reaction. This experiment should be randomized rather than a linear change. More data can be collected such as the price of the van, the variation of distance a charger need to go, and so on.

Modeling, Simulation, and Optimization

Modeling is very crucial to my analysis. There are two levels of model, while the first level is the model of the payment to chargers and the scooters they can charge. In this model, the payment to chargers is the independent variable, the number of scooters charged is the dependent variable. As the payment strategy changes, the workers' motivation will change simultaneously, thereby influencing their charging outcomes. Having this model, we can predict the average number of scooters charged by a charger and their salary under every strategy, and calculate the how many chargers we need to recruit under different schemes to satisfy all demands in San Francisco.

By multiplying the number of chargers by their salary plus the rent of vans, we can get the net expenditure. There will be a relationship between the salary strategy and the net expenditure, which is the second model. In this model, the salary strategy is the independent variable and the net expenditure is the dependent variable. Simulation is the combination of these two models and optimization is the process that use the two models to find out one solution, which minimizes the company's disbursement for scooter charging. The model assembly line presents the whole process of modeling, simulating and optimizing to deal with data collected.

Conclusion and Policy Recommendation

By using the drive train model, we will find the best solution to recruit and pay the chargers, which both satisfies the demand in San Francisco and minimizes the expenditure. **In this process, the predictive inference is used, as it associates the data collected and the model created to anticipate which adjustments the company makes are able to increase Bird Rides' interest.**

Part II. Real-world data analysis in R

Link of code:
https://drive.google.com/open?id=16YHar8H0UvywcA1mtb_xq6ggX7wMI6RS