FreightPower Carrier Dispatcher Survey Analysis

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Executive Summary

Throughout the summer of 2022, the FreightPower Carrier team with the help of 13 interns conducted a nine-week long phone call survey contacting over 5,000 disengaged FPC dispatchers. The survey both collected useful feedback from carriers along with its primary goal of serving as a test run for potential continuation of the process. This executive summary mainly focusses on survey continuation. See the *Analysis and User Insights* section for detailed feedback results.

Each day, around 150 users were contacted, asked a series of questions about their experience with the application, and then tracked to see if they would log back in after being called. Users that did log back in after at most four days were considered stimulated, and the overall proportion of stimulated users served as an indication of the survey's effectiveness. Note that a control group was also tracked and factored into the calculations, allowing the stimulation rate to truly represent only users that returned due to being called.

Of the users that were contacted, 56% agreed to take the survey. By the end of the project, it was determined that 14% of all users called had logged back into the application due to our solicitation. By making a set of high-level assumptions regarding the value created by a stimulated user and the cost of running the survey, it was estimated that with a stimulation rate of 14%, the survey would lose approximately $11.30 per hour if continued. However, despite these losses, I believe the survey process can be significantly improved to the point it can produce sufficient value for the company.

The first improvement that should be made is time optimization. The data from the original survey showed significant increases in call acceptance during late morning hours. Because stimulation odds increase when calls are accepted, calling during these optimal hours will likely result in a 2.6% increase in user stimulation according to the data. Furthermore, the duration of each phone call has a dramatic effect on the number of stimulated users a caller can produce per hour. Because the calling expenses are fixed, decreasing the average call duration from 4 to 2 minutes will result in an incredible 50% reduction in value loss. This can be achieved by removing certain survey questions, refining survey processes, and setting goals for reduced call times. The final means of improving the survey process is using predictive analytics. The data gathered from the survey was used to create a model that can predict whether or not a user will be stimulated prior to them being called. By testing the model with data it had never seen, it was determined that its predictions could result in a 16% increase in stimulation.

By combining all of these improvements together, the estimated tangible business value of continuing the survey can be increased to $9.40 per hour. At this value, it would absolutely be in the company's best interest to continue calling unengaged FPC dispatchers.

Introduction and Setup

Defining the Problem

For any application there is a constant struggle to bring as many users to the platform as possible. With that struggle comes actually retaining those users after bringing them in. FreightPower Carrier (FPC) already uses a variety of techniques to ensure its carriers stay engaged, but there are still a large number of users that fail to continue using the application after initially joining.

The following report summarizes the findings of a nine-week phone call survey targeting unengaged FPC dispatchers. The data was collected by calling over 5,000 dispatcher users and asking them a series of questions about the FreightPower Carrier application. The project began with the following goals:

1. To determine if calling unengaged FPC dispatchers produces enough business value through reengagement to continue the process
2. To gain insights on user suggestions and motivations for not logging in

Target Users

In order to be contacted for this survey, users were required to meet certain criteria. Target users were considered CARMA active dispatchers that hadn't logged in for 8-100 days. The following graphic summarizes the user filtration process:
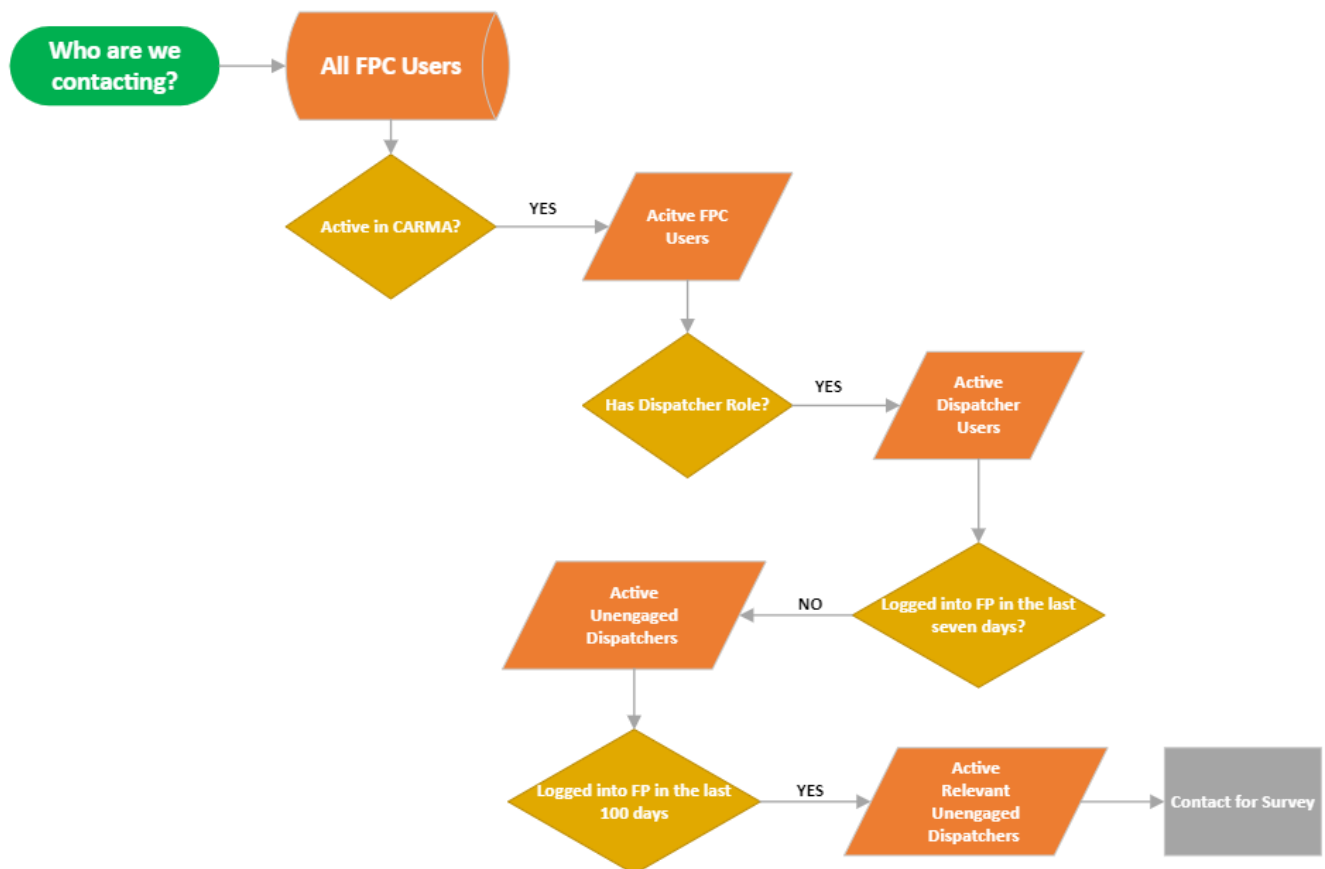
After the above filtering was applied, approximately 11,000 users remained; 5,042 of which were randomly selected to be contacted throughout the nine-week process. The following distribution of all CARMA active FPC dispatchers by the number of days since their most recent login shows where these target users lie.

Target Dispatcher Login Window
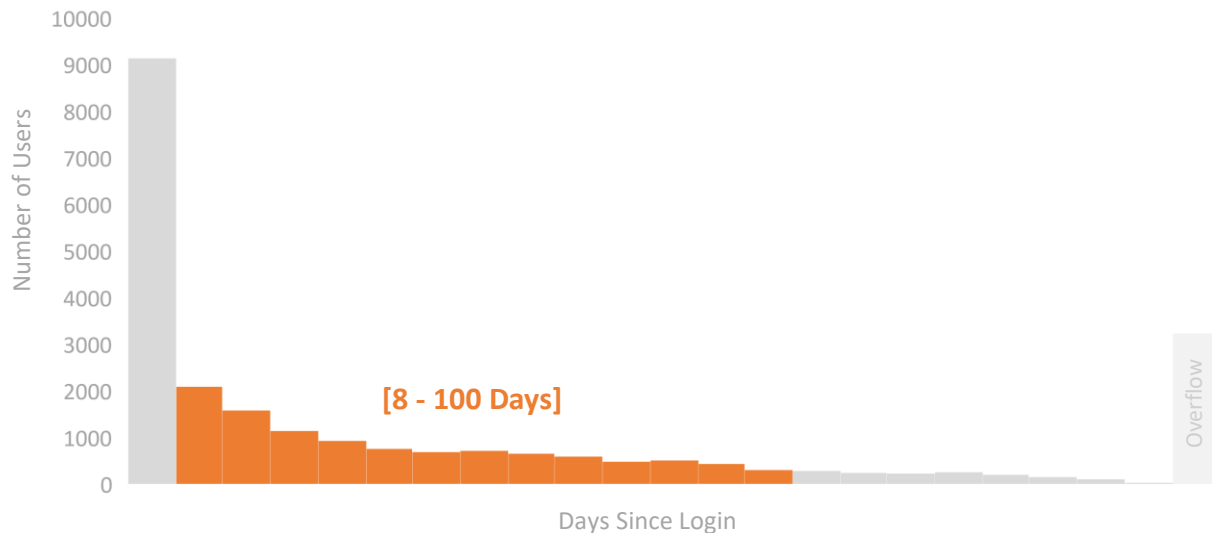
Call Process

Target users were gradually contacted throughout the duration of the survey in groups of around 150 users per day. Along with asking the users a series of questions, the callers were to assist the dispatchers with any issues they might have encountered when using the application. The following flow chart describes the calling process in detail:
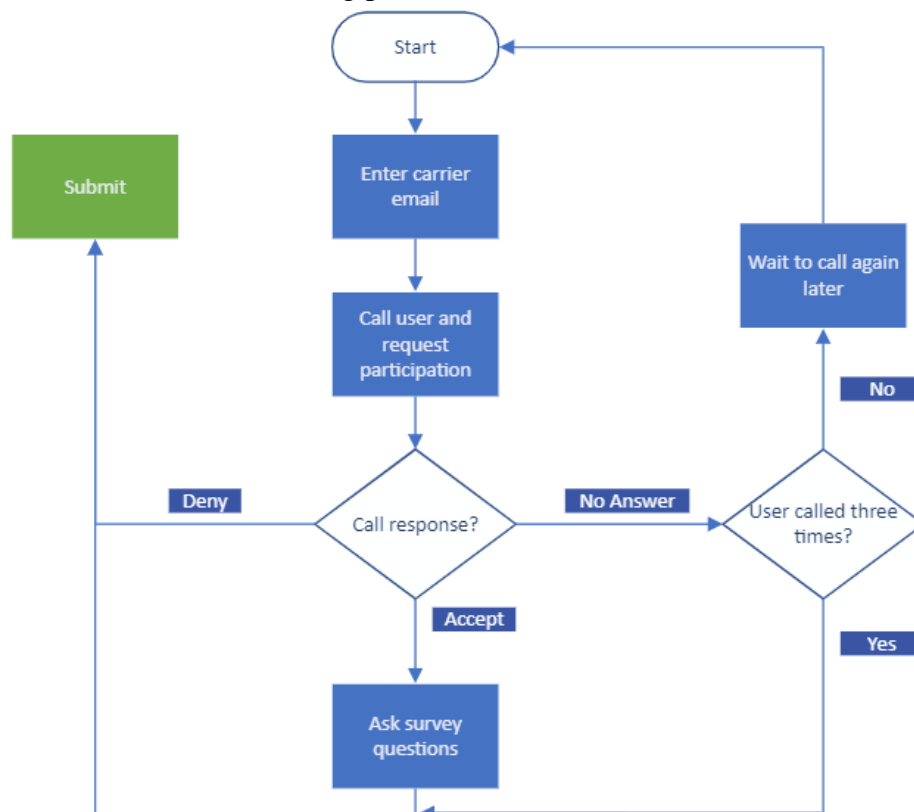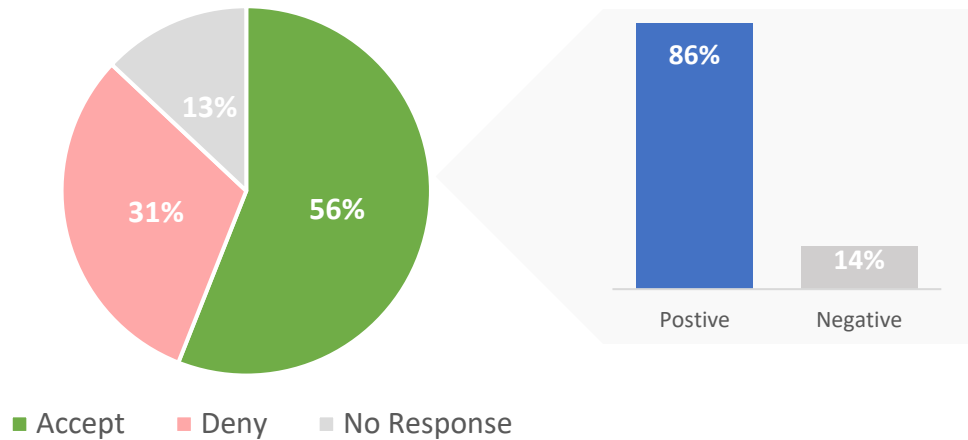
Analysis and User Insights

Summary statistics

Overall, 5,042 FPC dispatchers were contacted and asked to take the survey, majority of whom agreed to participate. Of those users who accepted, nearly 9 out of 10 were considered to have provided positive feedback by the callers:

Majority of Calls Accepted and Considered Positive

Disengagement Reasons and Suggestions

Once a user accepted a call, they were then asked the following questions about their experiences with the application:

- What was your reason for not logging into FPC recently? (Disengagement Reason)
- What suggestions do you have for the application? (Suggestions)

The following visuals display the distribution of disengagement reasons along with a word cloud summarizing responses categorized as "Other". Note that words within the word cloud have been reduced to their stem in order to properly analyze how frequently they occur.

Disengagement Reasons

"Other" Disengagement Reason

The next word cloud summarizes what suggestions the users had for the FPC application in two-word phrases. The words are again reduced to their stem. Additionally, the word "bid" has been removed from the cloud in order to bring out other lesser-known suggestions. The FPC team is well aware of users' desire to bid on loads within the app.

User Suggestions

Measuring Success

Stimulation Lift

In order to determine how much value continuing the call process would produce, it is important to first calculate how effective calling our target users was at getting them to log back into FPC. This can be measured by tracking user logins after they were contacted. A user is considered "stimulated" if they log back into the application at most four days after being contacted. However, there will also be a number of users that would have logged back into the application regardless of being contacted. This is why it was important to track a control group from the same population of target users that was never called to see how often they return to FPC on their own. By subtracting the control group stimulation rate from the overall survey stimulation rate, we then have the actual proportion of users that returned to the application directly because they were contacted (stimulation lift).
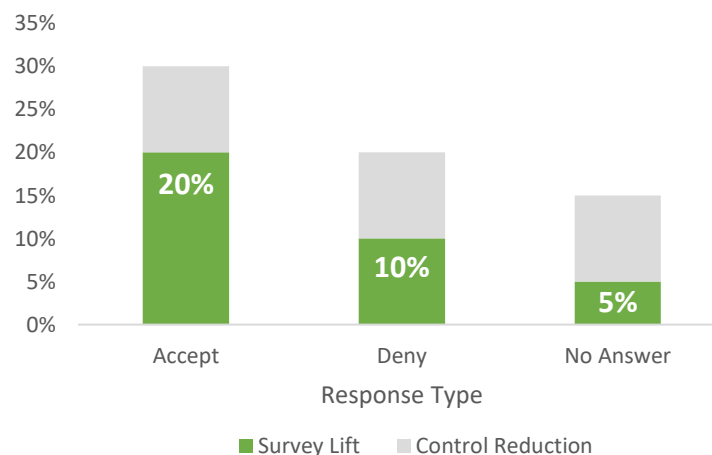
Stimulation Lift = Survey Rate - Control Rate

The survey stimulation lift will serve as an indication of how effective the survey calls were at getting users to return to FPC. Overall, with 24% of all users returning to FPC after being contacted and 10% of our control group logging back into the application, the actual proportion of users that were stimulated by the survey was 14%.

14% Increase in User Stimulation

76%	14%	10%
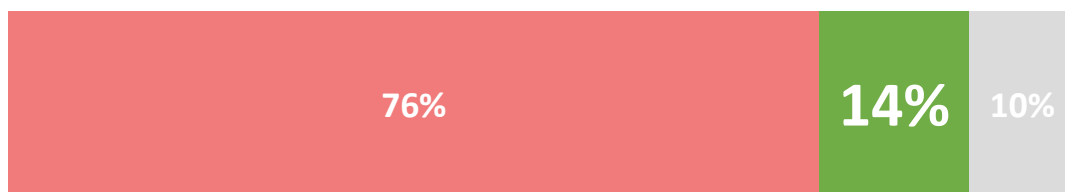
■ No Stimulation ■ Stimulation Lift ■ Control Stimualtion

Response Type: Accept 20%, Deny 10%, No Answer 5%

■ Survey Lift ■ Control Reduction

Value Analysis

With a stimulation rate of 14%, the question of whether or not calling disengaged FPC users creates enough business value to continue the process is raised. In order to answer that question, the following estimations must be assumed:

- Paying someone to make calls would cost $170.00 per week
    - 10 hours per week
    - $17.00 per hour
- The weekly tangible value of running the survey would be $57.00
    - 21 stimulated users per week at 10 hours per week
    - $2.70 weekly value per stimulated user

Assuming the above conditions, running the survey at 10 hours per week would result in a tangible loss of around $113.00 per week, or $5.40 (-113/21) per stimulated user.

Hours per Week	10
Calculations	**Week**
Tangible Value	$ 57.00
Cost	$ 170.00
Loss	$ (113.00)
Logins	21

With the above assumptions, there is not enough evidence to support continuation of the survey. However, it would be inaccurate to assume the only value created by a user being stimulated would be from their likelihood to book a load from that single login. Here are a couple examples of the immeasurable value of a stimulated user:

- The possibility a survey stimulation might cause a user to login multiple more times after their initial reengagement
- The intrinsic value of a user logging in regardless of their likelihood to book a load
- The known tendency of carriers to search for freight on FPC but book the loads through other means

In order for the dispatcher survey to continue under these conditions, the additional value of each stimulated user would have to exceed $5.40 (113/21).

Process Improvement

Introduction

With a stimulation rate of 14%, it would not be in the company's best interest to continue calling unengaged FPC dispatchers under the current process. Even though the estimated loss would be reduced by some of the immeasurable value of a stimulated user, the amount would likely not be sufficient enough to be certain the survey would turn a profit. However, I believe the survey process can be significantly improved to the point that it can produce sufficient value to the company. Through both process optimization and predictive analytics, the provided value of the dispatcher survey can be substantially increased to the point it should be continued.

Process Optimization

When the process for this project was first created, there was no existing information about what sort of practices might contribute to the survey's success. For example, there was no way to know if the time of day had any effect on whether or not a user would accept taking the survey. However, now that such data exists, we can look for certain trends that might lead to higher call acceptance rates. The chart below shows the call acceptance rate for each hour of the day. We can see that the acceptance rate at the hours 9, 10, and 11 surpass the overall average by over 13%. By making calls during these hours, call acceptance rates, along with stimulation rates, would likely increase.

13% Increased Acceptance Late Morning
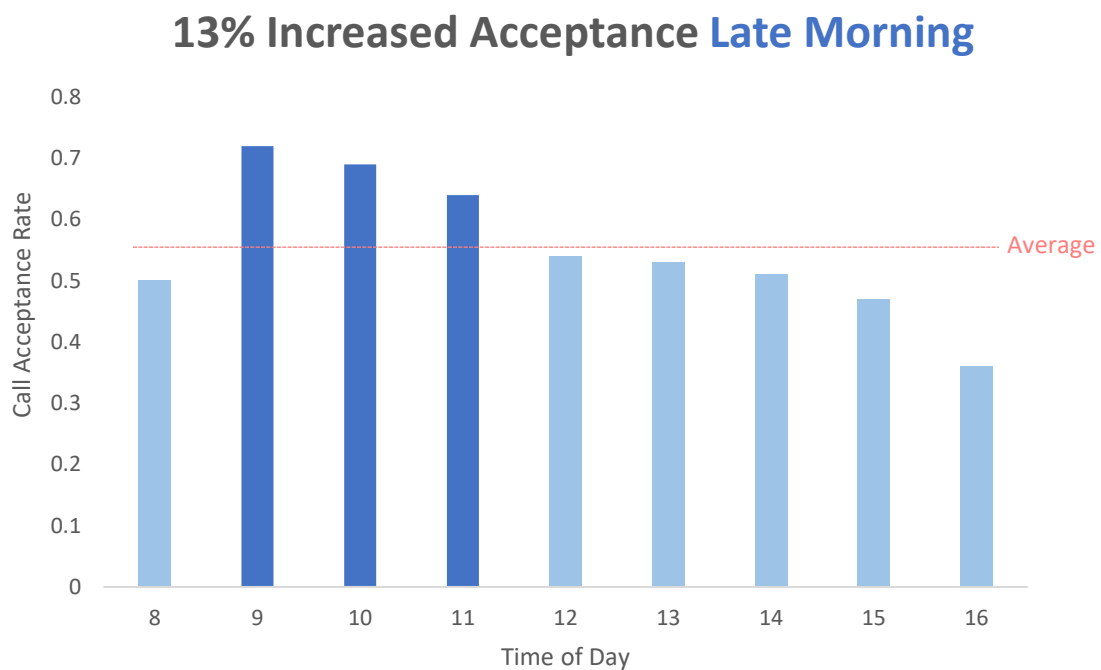
With 20% of all accepted calls resulting in a stimulation, a 13% increase in accepted calls would result in a subsequent 2.6% incrase in survey stimulation lift.

Another relatively controllable factor of the survey process is the call duration. Higher call durations ultimately result in a significantly lower hourly contact rate. Using the same assumptions as before in the value analysis section, the following chart depicts how predicted loss can be minimized by decreasing call durations.

**Loss Reduction with Decreasing Duration**
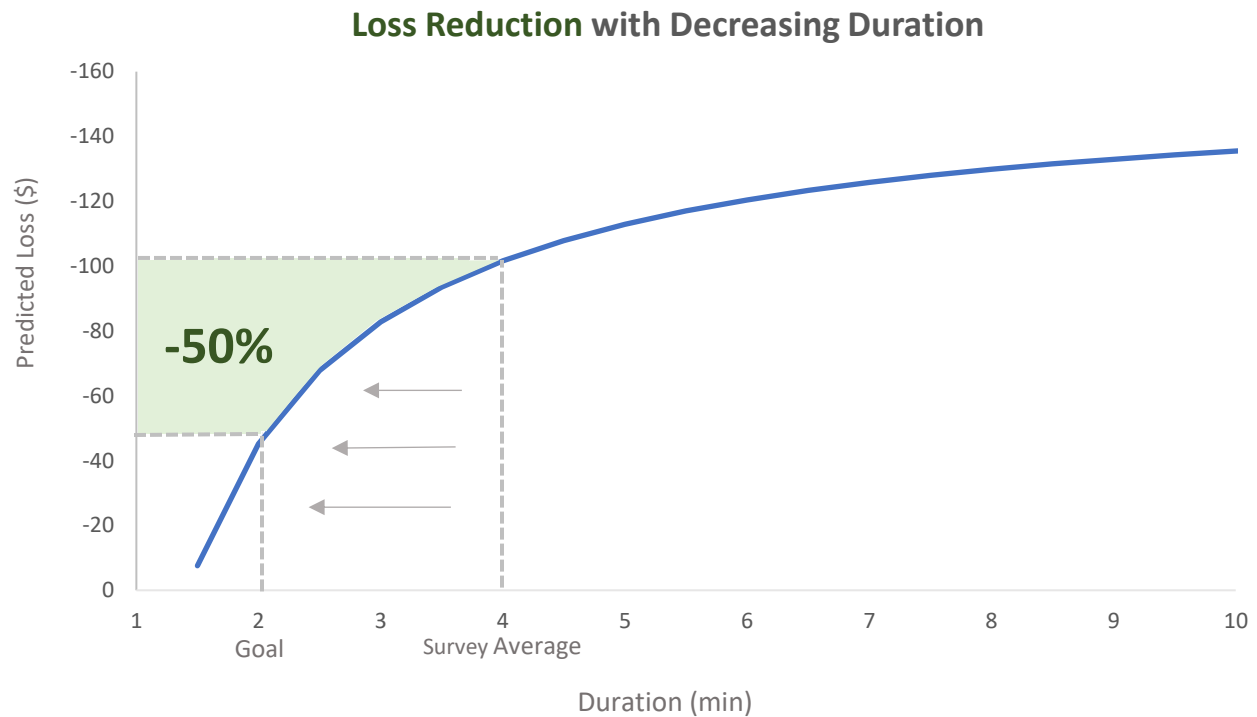
By removing survey questions, refining call processes, and setting goals to reduce call times, it is certainly possible the average survey call duration can be reduced to 2 minutes. With that reduction comes a significant 50% increase in estimated value creation.

Predictive Analytics

Another method of increasing survey value is maximizing the overall stimulation rate. With the data gathered from this project, a model can be trained to estimate a user's probability of returning to the application prior to being called. With this prediction, we can avoid contacting users that would likely fail to be stimulated, hence, increasing a caller's overall efficiency.

The four features used to predict user stimulation include: carrier domicile, carrier sponsorship, carrier size, and the number of days since the user's last login. The following charts show the relationship between each variable and their stimulation rates:

Stimulation Model Features

Stimulation vs Size Category

Stimulation vs Days Since Login

Stimulation vs Sponsorship

Stimulation vs Carrier Location
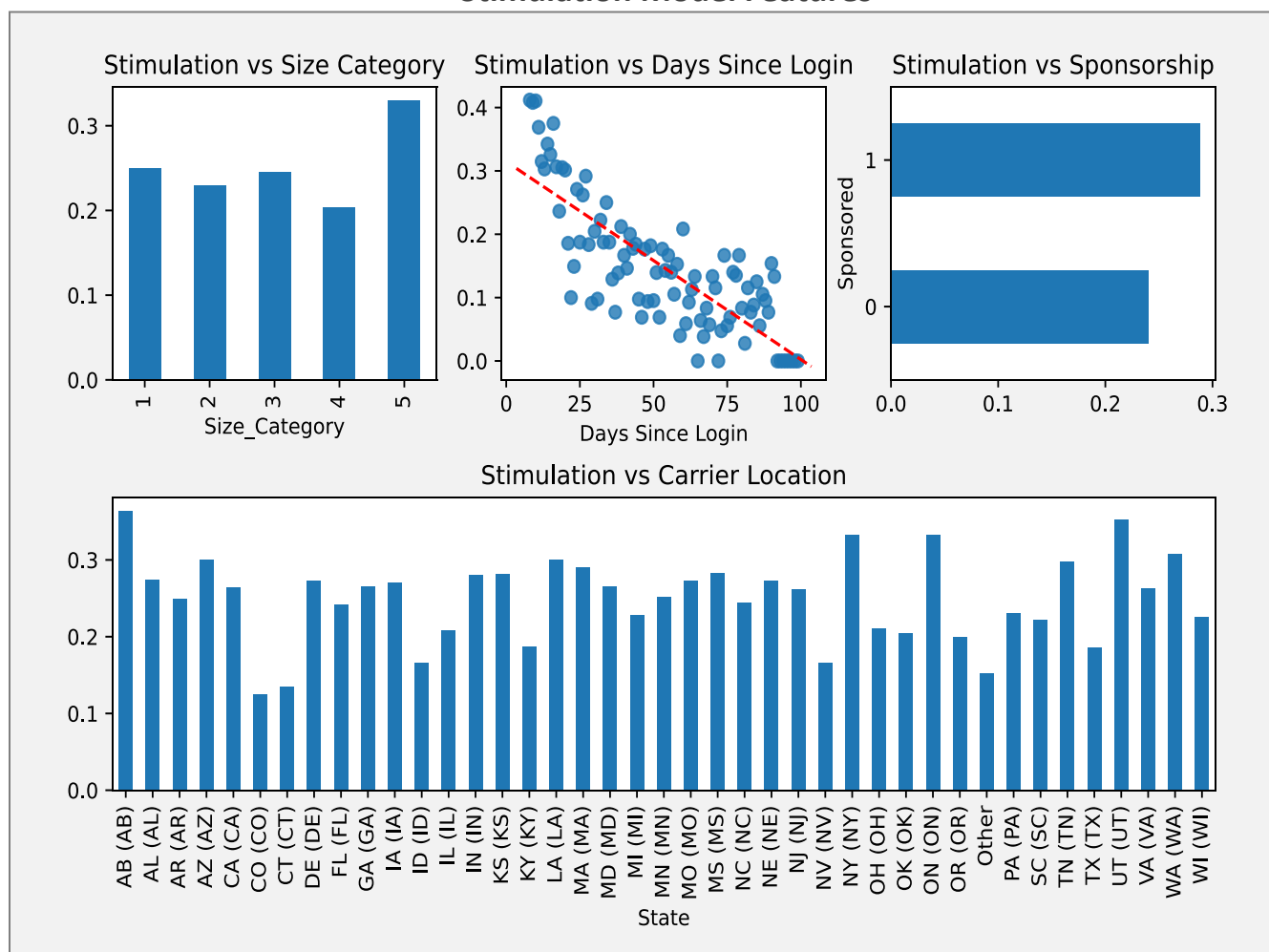
With each feature you can see that there is a considerable effect on stimulation for every incremental or categorical change. The prediction model takes these variables, measures their effect on stimulation, and creates an equation used to predict the stimulation probabilities of new data points. In order to test how well the model performed, 75% of the survey data was used to create the prediction equation, and 25% of the data was used to test the predictions it made. For example, after the model was created with 75% of the data, it ran the rest of the data through it pretending to not know if those users were actually stimulated during the survey. After the model had made its own prediction for each test user, the estimates were compared with the real stimulation outcomes to see how well the model performed.

Model performance was measured by two metrics: precision and recall. **Precision** is a representation of how good the model is at predicting stimulated users. For example:
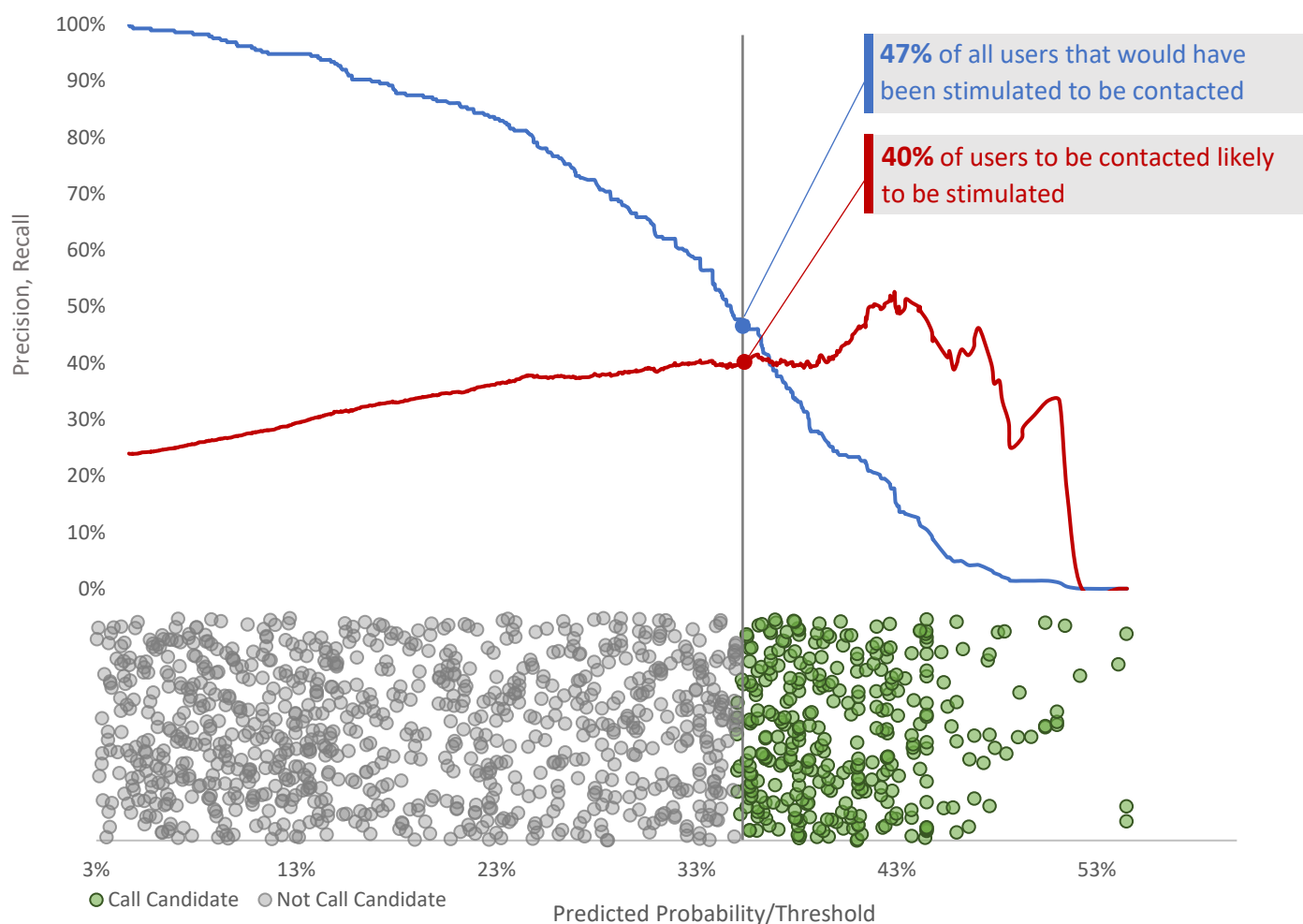
> If the model predicted that 100 users would be stimulated, and in reality, 40 of those predicted users were actually stimulated, the model precision would be 40%.

Recall is the percentage of all users that the model predicted to be stimulated out of all the users that would have been stimulated by a call. It is useful for telling us how many stimulated users the model failed to notify us about. For example:

> If in reality 100 users would have been stimulated by being called, and the model only told us that 47 of those users would be stimulated, the model recall would be 47%.

Typically, both of these metrics are inversely related when plotted against the model's probability threshold. That is, as we require a user to have a higher estimated probability in order to be predicted as stimulated, recall decreases and precision increases. The visualization below summarizes these effects. Each dot on the bottom half of the chart represents a user plotted against their predicted probability of being stimulated. Green users represent those who meet or exceed the probability threshold of 35%. Following the threshold line upwards you can see the respective precision and recall values.

Balancing Model **Precision** and **Recall**

47% of all users that would have been stimulated to be contacted

**40%** of users to be contacted likely to be stimulated

Setting the model's probability threshold to 35% would increase the raw survey stimulation rate from 24% to 40% while still capturing a good portion of the true population of users that would be stimulated by a call. This means that we would see a <u>16% increase in actual survey stimulation</u> by allowing the model to determine what users to call.

Recommendations

Putting Everything Together

By applying each optimization method to the survey procedure, weekly estimated business value can be increased by 180% with an average call duration of 2 minutes. At this level, the survey would no longer be operating at a loss under the assumptions from the value analysis section. Additionally, the optimized process can continue to remain profitable up until an average call duration of 3 minutes, allowing for some flexibility in call length. Furthermore, these calculations exclude all immeasurable value a stimulated user produces, meaning the true amount of value the survey creates likely exceeds these estimates.

Hourly Value Gain by Duration
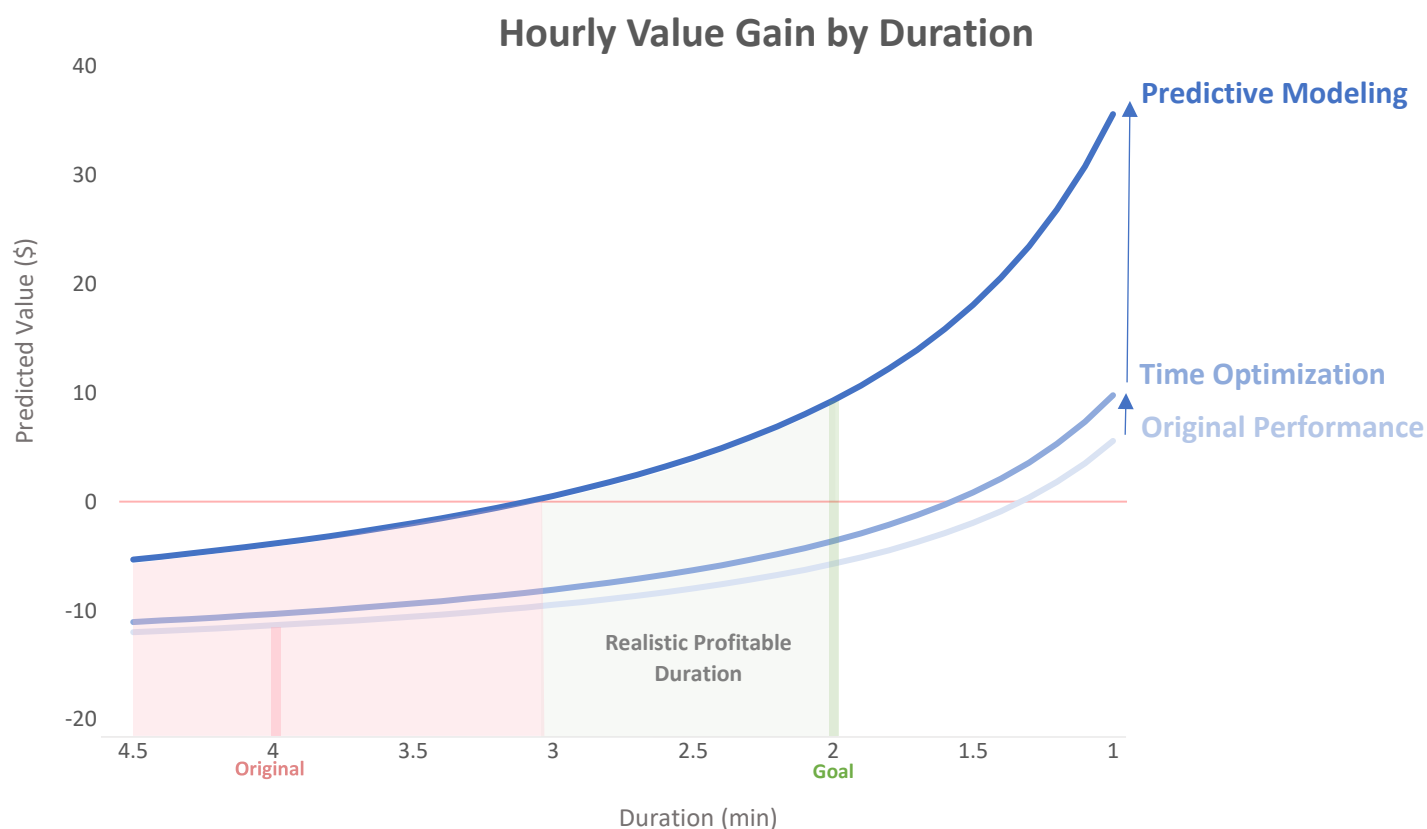
Improvement Method	Metric	Cumulative Hourly Value	
Origional	-	$	(11.30)
Time Optimization	+2.6% Stimulation	$	(10.30)
Model Optimization	+16% Stimulation	$	(3.80)
Duration Optimization	-2 min duration	$	9.40

Process Continuation

The following table summarizes the recommended controllable factors for the updated calling procedure:

Controllable Factors	
Hours per Week	> 5
Hourly Wage	$ 17.00
Avg. Call Duration	2 min.
Call TOD	9 AM - 11 AM

With this optimized calling process producing an estimated $9.40 in tangible business value per hour along with a considerable amount of immeasurable value, it is absolutely in the company's best interest to continue calling unengaged FPC dispatchers. By transforming the survey into solely a means of user reengagement rather than a method of obtaining user feedback, making calls during optimal hours, and utilizing predictive modeling, the FPC calling process can be significantly improved to the point it becomes valuable to the company.