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**Advanced Marketing Analytics (MKTG 881)**

**Assignment 1. AB Testing at Vungle**

**Due Date: 9/20 (Sunday) by 11:59 PM**

* Using the Vungle case, answer questions below (each question is worth 2 points).
* For analysis, download 'Vungle data.xlsx' on Canvas and import the Excel file into Stata.

1. Summarize the mobile advertising market situation.
   1. In the US, consumers spend close to three hours a day on their mobile devices as of 2013. Most of that time, about 86%, is spent on mobile apps. Because there are so many people on apps so often, this has created a new channel for advertisements. According to the Mobile Marketing Association, three quarters of the ads seen by mobile customers were in apps and this was market is growing by 60 percent annually as of 2013. By 2014, ads changed from banner ads that were most often accidentally clicked to 15-second video ads that promoted a new app or product. iPhone apps accounted for 80% of these ads and they peak around prime TV hours as this is probably also the peak mobile device usage time.
2. What are the parties participated in the in-app mobile ad market? How does the in-app mobile work?
   1. There are four parties that participated in the in-app mobile ad market. There is the user of the mobile device, the publisher of the app, the advertiser promoting their product through the advertisement and the advertisement platform that matches users of particular apps to advertisements, like the company involved in this case, Vungle.
   2. The process for delivering the in-app mobile advertisement goes like this:
      1. When the user launches the app, the advertisement platform loads an ad to the device in the background based on the data it has for the user and which ad they think would be most effective for said user.
      2. Then at some point during the gameplay, maybe after the user loses the game or some other time specified by the developers of the app, the ad comes to the foreground, or is served to the user, and the user must watch the app to continue playing.
      3. At this point, a few things can happen:
         1. The user can leave the app to avoid watching the advertisement.
         2. The user can click the ad to be redirected to the app store to be able to then decide whether to download the app being advertised.
         3. The user can simply watch the ad entirely and continue to use the app they’re currently using.
      4. This creates a funnel where we have:
         1. Requests for the advertisement when the user starts the app.
         2. Impressions when the user sees some part of the advertisement.
         3. Completes when the user completes the advertisement.
         4. Clicks when the user clicks the advertisement.
         5. Installs when the user installs the app being advertised.
3. How does Vungle make money? What is the typical measure of the effectiveness of an app-promotion and the success of the serving platform?
   1. In the vast majority of the time, Vungle makes money when the app that they are advertising for is installed by the user of the app that is showing the advertisement. The fee is paid by the app being advertised and 60% goes to the app showing the advertisement and 40% goes to Vungle.
   2. The typical measurement if effectiveness is eRPM, or total effective revenue for Vungle and the advertised app per 1000 advertisements served, or impressions, which varies from two to seven dollars in each campaign.
4. How does the new algorithm differ from the existing algorithm?
   1. The new algorithm uses a data-science approach that utilizes historical information about users, publishers, and installation rates to pick the ad that they believe has the greatest chance to lead to an installation by the user and thereby maximize the eRPM.
5. What are the key questions Vungle would like to know through the experiment?
   1. Vungle would like to know the answer to the following key questions:
      1. Does the new algorithm (B) outperform than the existing algorithm (A)?
      2. If B does indeed outperform A, how much would it increase annual revenues?
      3. Is this increase enough to justify the up-front required data science investment?
6. What are the averages of eRPM for condition A and B?
   1. The average eRPM for A was 3.3471 and the average eRPM for B was 3.459.
7. What are the averages of conversion rates for condition A and B?
   1. The average conversion rate for A was 0.004027 and the average conversion rate for B was 0.003438.
8. Test whether eRPM for condition B is different from A. Report the result.
   1. The t-value for the null hypothesis that the mean of A’s eRPM equals the mean of B’s eRPM is -1.5064 which because its absolute value is less than two means that we can’t reject the null hypothesis with 95% certainty, so can’t say that condition B is different from condition A. In other words, we can’t say that the eRPM of the new data science algorithm strategy is any different than the eRPM of the existing algorithm strategy.
9. Test whether conversion rate for condition B is different from A. Report the result.
   1. The t-value for the null hypothesis that the mean of A’s conversion rate equals the mean of B’s conversion rate is 8.8156 which because its absolute value is more than two means that we can reject the null hypothesis with a very high degree of certainty, so we can say that condition B is different from condition B. In other words, we can say that the conversion rate of the new data science algorithm strategy is different from the conversion of the existing algorithm strategy. And because the mean of the existing algorithm strategy is greater than the mean of the data science algorithm strategy, we can say with a high degree of certainty that the new data science algorithm is worse than the existing algorithm.
10. What would you advise Jaffer regarding the performance of the new data science algorithm?
    1. Personally, I would advise Jaffer to continue trying to find a better algorithm using data science because that intuitively makes sense to me. He should, however, abandon, or extremely change his current data science algorithm because it does not increase revenue and actually hurts conversion rate among Vungle’s clients’ users.