Drill: What can data science do?

1. You work at an e-commerce company that sells three goods: widgets, doodads, and fizzbangs. The head of advertising asks you which they should feature in their new advertising campaign. You have data on individual visitors' sessions ([activity on a website](https://en.wikipedia.org/wiki/Session_%28web_analytics%29), [pageviews](https://en.wikipedia.org/wiki/Page_view), and purchases), as well as whether or not those users [converted](https://en.wikipedia.org/wiki/Conversion_marketing) from an advertisement for that session. You also have the cost and price information for the goods.
2. You work at a web design company that offers to build websites for clients. Signups have slowed, and you are tasked with finding out why. The [onboarding funnel](https://en.wikipedia.org/wiki/Funnel_analysis) has three steps: email and password signup, plan choice, and payment. On a user level you have information on what steps they have completed as well as timestamps for all of those events for the past 3 years. You also have information on [marketing spend](https://en.wikipedia.org/wiki/Marketing_spending) on a weekly level.
3. You work at a hotel website and currently the website ranks search results by price. For simplicity's sake, let's say it's a website for one city with 100 hotels. You are tasked with proposing a better ranking system. You have session information, price information for the hotels, and whether each hotel is currently available.
4. You work at a social network, and the management is worried about [churn](https://en.wikipedia.org/wiki/Churn_rate) (users stopping using the product). You are tasked with finding out if their churn is atypical. You have three years of data for users with an entry for every time they've logged in, including the timestamp and length of session.

Answers:

1. Widgets, Doodads and Fizzbangs

First, we need to figure out the business’ goals. Do they want to sell more of the most expensive product (price) or perhaps more of the highest margin product (price – cost)? This is a revenue versus profit conversation, which is a business choice based on a lot of other factors.

The project I would design would be to look at only users that converted from an advertisement (remove organic purchases). The analysis also needs to calculate cost per conversion, so how much did I spend to convert each customer into a purchase. It might be enough to pick a product based on cost of conversion so that way you know your ad campaign dollars are going to be the most efficient.

Other analyses might be to determine which components of past ad campaigns created the most conversion or had lower costs of conversion. At that point, you might look at visitor session information to see time spent until purchase, where users who didn’t buy were lost in the purchase journey, and how to maybe streamline the purchase journey to increase conversion. Typically, you want as few clicks between click on an ad and the final purchase click. Perhaps one of the products has more steps/clicks involved and is losing more conversions as a result.

1. Onboarding Funnel

I think you need to tackle 2 issues here: Is your marketing spend capturing the right consumers? And how can you streamline the onboarding funnel to not lose as many customers.

In terms of the onboarding funnel, I would want to break out the time spent in each step for those who leave and those who move to the next step. Looking at central tendency for these measures alone might start to identify the difference in time spent per customer and determine an issue. You might try to develop an A/B experiment that tests different sign up processes to make it faster (more in line with the average time spent for those who move to next step) and see if conversion increases. You might also need to look and see if price is an issue in the final step. Look at where the majority of users are lost, if it’s the last step (price), then you may want to create another A/B experiment testing dynamic pricing or lower pricing. With the marketing data, you might be able to feed different pricing levels based on where the customer came from or how much was spent to get them. I think there are quite a few experiments available here to optimize the onboarding funnel with A/B tests to small samples.

As to the marketing spend, I would look at cost per customer (as mentioned before) and which channel the customer came from (assuming you’re not spending on all your marketing dollars in one place). Perhaps you’re just not spending as much as before when you had more signups if the cost per customer has been constant. Perhaps you’re getting more traffic or spending more at channels that have lower conversion rates than you were in the past. Or you might find that customers who come from one channel are inherently different in their response to the onboarding funnel. Customers who come from channel A (a gaming website) have more time to spend in the funnel then customers coming from channel B (a business website). They may also exhibit different price sensitivities that you would want to optimize for as well.

1. Hotel Website Rankings

It depends on what the website’s business model is. Does the website make money from advertising and therefore you want to maximize session time or is money made from a commission off of the purchase so you want to increase purchases? If advertising, then I would design the ranking system for time per session. Get people to spend the most amount of time on the website, which isn’t necessarily a bad thing it just could mean there is more information on those hotels for a consumer to decide. When it comes to hotels, more information is probably better to understand fully what you’re buying. If you make money from more purchases, then I would filter for available hotels, and then rank based on successful conversion from a session. You would probably want to continue to test if higher conversion was a result more from being higher on the ranking system than the hotel being more preferred by customers.

1. Social Network Churn

I would start by looking at how their churn has changed over time, what is the average time spent on the website today versus 3 years ago? That might start to identify internally whether the product is getting stickier for less sticky for consumers. Once I’ve looked at churn recently, I would try to compare that with other companies doing similar things with similar audience metrics. That would be the best way to look and see if churn was ‘atypical,’ benchmark against other competitors. Finally, I would look at the session information and see what consumers were doing last before they left. Perhaps there is a part of the website that is causing users to leave, at which point you would want to change something on the website and see if that decreases churn.