Session – Summary

A/B Testing

Data analytics has various applications in the ecommerce domain. Most of these applications help with profit maximisation for an ecommerce firm. As you have seen earlier, one of the ways in which this is achieved is through improving the customer experience on the platform. There are two ways to do this — developing recommendation models and carrying out A/B tests to figure out the best variation of the site from various possible alternatives. A/B testing helps you take data-driven decisions instead of just relying on your intuition or gut-feeling to figure out the best variation of a web page.

You also saw what kind of changes can you validate through an A/B test, and also looked into a few business cases where A/B tests have led to an increase in the company's bottom line. Then, you moved on to the mathematics and steps involved in A/B testing. Finally, you saw the demonstration on setting up the A/B test on the Optimizely platform.

Understanding A/B Testing

While developing an ecommerce website, there may be conflicting opinions about various elements, such as the shape of buttons, the colour of various UI elements, the text on the website, and numerous such things.

Some of these can be extremely crucial decisions. For example, you may have to choose features on the payment page which maximise the chances of a customer completing the payment. We have all come across buggy websites and apps, running away as soon as they ask us to fill some form or have an untidy payment gateway.

To resolve such conflicts, you can use A/B testing. A/B testing provides a way for you to test two different versions of the same element. Let's see how exactly this works.

Let's say that you're working on a website. A is the existing design of your website. This design is called the control. B is the newly designed version, which is called the variation. To conduct the A/B test, you have to divide the traffic between the control and the variation, i.e. A and B, and measure the performance of each design using the metrics which are important to your business. At the end of the test, the data collected will help you select the better performing version for your website.
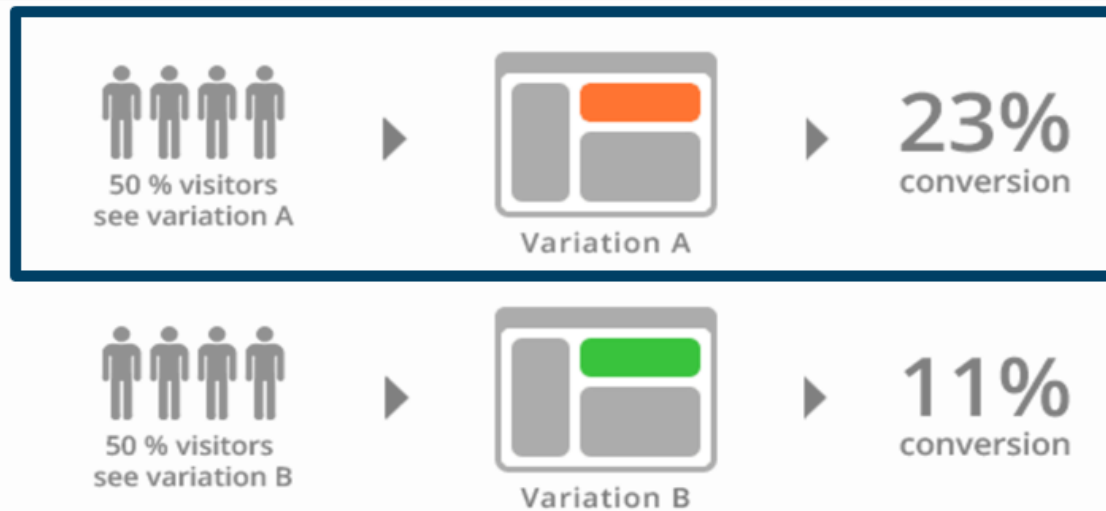
Figure 1: A/B Testing

Steps in A/B Testing

There are four major steps involved in A/B testing. These are:

- Analysing the data
- Forming a hypothesis
- Constructing the experiment
- Interpreting the results

Analysing the data

What data is available to us for analysis? First, we have quantitative data like:

- Web traffic: Number of page views/clicks made per day
- Order history: How many successful checkouts are made
- Customer Support Requests: How many times a customer support request is made

Then, you have some qualitative data obtained from a select group of test users who provide feedback on their experience of the website. Thus, a combination of both the quantitative and qualitative data helps you formulate an A/B test. While the quantitative data helps you decide where to test, the qualitative data helps you decide what should be tested.

For example, in DeWalt's example, the quantitative data was that many people dropped off before clicking on the 'Buy Now' button. However, this in itself is just an insight and not a recommendation to do anything. If you combine this with insights from the qualitative data obtained from test users, you can design an A/B test. In this case, the qualitative recommendation was to change 'Buy Now' to 'Shop Now'.

In this way, analysing various data sources can help you decide the different cases on the platform based on which you can run A/B tests to optimise further.

Forming a hypothesis
The hypothesis of an A/B test can take the form **'If [Variable], then [Result], because [Rationale]'**. For example, in the earlier example, the hypothesis can be:

> If [you change the text of the button from 'Book Now' to 'Shop Now'], then [it will attract more number of clicks], because [during user research, this was the derived conclusion].

Constructing the experiment
Before constructing an experiment, there are some additional concepts related to hypothesis testing that you must recall here.

You are aware of the two types of errors that can result during the hypothesis testing process. These are the type I error and the type II error. A type I error (represented by α) occurs when you reject a true null hypothesis. A type II error (represented by β) occurs when you fail to reject a false null hypothesis.

Now, ideally, you would want to have as low an α and β as possible. But reducing the probability of type I error would result in an increase in the probability of type II error. In such a scenario, if both α and β have to be reduced, the only option is to increase the sample size.

Now having refreshed your knowledge about hypothesis testing, let's get back to A/B testing. Before running an A/B test, you need to decide a few parameters:
1. Reliability (α): This is the probability of making a type I error or the probability of rejecting the control in favour of the variation, even though the control was more effective than the variation. $1 - \alpha$ is known as the reliability of test. α is generally taken to be 5%.
2. Power (β): β is the probability of making a type II error, i.e. choosing the control, even though variation was actually an improvement on the former. Power is defined as $1 - \beta$ in this case.
3. Effect size threshold: This is the minimum threshold level of improvement that you would expect from a newer variation before you can decide to discard the older version. For example, using your business understanding, you decide that you would choose the variation over the control only if it shows a minimum of 2% increase in click-through. If the improvement in the click-through is less than 2%, you will retain the control version.

Once all these three parameters are decided, let the A/B test run until you get the desired number of samples. Finally, make sure that there are no biases in the selection of users for the control or variation group.

Interpreting the results

After you obtain the desired number of samples, check if you can make a statistical conclusion if variation B outperforms control A by the decided effect size threshold.

- If B outperforms A, launch the variation and update your website
- If B does not outperform A, retain the existing version

A/B testing, if employed correctly, is a powerful tool to understand customer behaviour and drive revenue. It's also an important tool which helps a company become data-driven instead of hunch-driven.