Study Report

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1 Introduction

As stated pricing is a sensible experiment and using real time data to conduct an A/B test for data-driven pricing decisions in for digital goods, especially in our case which is providing SaaS which involves no cost of production is quite challenging. One of the reason could be because now the pricing has to depend on the value of the product in the market. So the solution will be to test the product with different margins.

2 Study Objective and Problem statement

The test will show firstly, how A/B testing can be used as a tool to measure price sensitivity of SaaS product. the relationship between price and quantity demanded will be conducted with the help of controlled web experiment, A/B testing. However, in an industry where marginal cost is very low or close to zero the decision making in regards to price setting gets a whole lot more complex. evaluating the Price sensitivity of the customers by making use of a controlled experimental method, A/B testing.

3 Experiment Setup

Hypothesis: Alternate Hypothesis: Company revenue will increase if we change the price to 10$/month.

We start with defining the sample size in order to calculate how long we should run the test.

As hinted we would like to compute the sample size to detect a 10% increase in conversion rates where the current control conversion rate is 1%.

- **Note:** To count as a successful conversion the visitors of the page has to purchase the product.

The purpose of this test is made to test two different sets of prices and pick the price that leads to more profit. We start with defining the sample size in order to calculate how long we should run the test. As per the requirements the formulae above assumes desired confidence level is 95% .Half of the group will be assigned the treatment page, which will state higher prices and the other half will be assigned the controlled page, which will state today's current price.Since we have the baseline values the effective sample size can b calculated. I used the particular website to calculate the sample size for the desired conversion rate.
[4]
The sample size required to achieve the Minimum Detectable Effect (MDE) is 157,697 per variation. I also cross checked with other websites which nearly showed the same number of sample size. also the other website that I cross checked.
[1]

3.1 Math behind Sample Size

After doing some research I have realised that the sample size required for acceptance/rejection of the null hypothesis for the performance indicators of interest such as revenue and

the conversion rate depends on the conversion rate of our control group which is 1%, the Minimum Detectable Effect (MDE) that is 10%, confidence level which is 95% in our case, statistical power which is 80% and the type of the test In our case it is one tailed because we are interested in knowing if the decrease in price will increase the revenue rather than what will happen if we decrease the price. The math behind determining Sample Size.

1. The conversion rate of control A: 1%
2. The minimum improvement over the conversion rate of the existing status quo that we want the experiment to detect is 10%

- **Note:** The conversion rate formulated in relative terms instead of absolute Relative change expresses the absolute change as a percentage of the value of the indicator.

After defining the value of the type 1 error and type 2 error the formulae for calculating the sample size formulae for one tailed tests:

$$n = \frac{(Z_\alpha + Z_{1-\beta})^2 * (C_A * (1 - C_A) + C_B * (1 - C_B))}{(C_A - C_B)^2} \tag{1}$$

Where

- n defines the sample size for both the treatment and control group.
- Z_α - confidence level
- $Z_{1-\beta}$ - statistical power
- C_A the conversion rate of the control group
- C_A the conversion rate of the treatment group

4 Implementation

For efficient implementation the randomization algorithm which spilt's the user's evenly over the population groups, importantly assigns same variation on each visit to the site. There are different techniques such as pseudo-random with a caching method and hash and partition method and many more which can be used.

5 How long should the test run for

As hinted for 10% of MED with Estimated existing conversion rate and 2 variations, the website suggested 3 days. I would run the test completely instead of stopping for efficacy for efficient results.

6 Metrics to measure performance

I would use revenue per visitor as the best metric instead of the conversion rate because the hypothesis is to test if Company revenue will increase if we change the price to 10$/month. Because even though we may end up selling less at our higher price point, the total revenues may actually be higher with lower conversion rate. **We can multiply Conversion rate and Price of the product that is original or variant** [2]

$$RevenuePerVisitor = ConversionRatexAverageOrderValue \tag{2}$$

- Average Order Value(AOV) is order value which is either 12 or 10 in our case.

7 Things learnt and noticed

- Offering exactly the same product/service at different price points is illegal and can lead to a huge potential lawsuit. So in the above test I would add feature differences which actually don't make significant difference, or test same product at two different price at two different times [6]
- Things to consider while changing price especially in SaaS product learned from this article which gave me the insights [3]
  - Market position.
  - Buyer personas.
  - Price vs. value.
  - Important secret of success
    1. Acquiring Customers
    2. Retaining Customers
    3. Monetizing Customers
- Understanding visitors behaviour at the same time looking at the insights and solutions to some of the problems you uncover with the data that is quantitative and qualitative research.
- There is also a way of not to run A/B tests
  - avoid repeated significance testing errors which could lead to error. the solution is to fix on a sample size in advance and wait until the experiment is over before you start believing the variant outperforms the original
- Sales Efficiency Metrics – SaaS Magic Number
- Psychological Pricing Strategy - Magic numbers and price endings
- SMALL FINDING:
  - **While comparing to the other competitors i have noticed that they all have the drag and drop in the home page indicating they can try free testing with out paying.**

- In our website we do not have it in the start page where customers can miss a chance of free test(2 documents a day), we can only find that by hovering on the particular function, I do not know the reason, i pre-assume that you would have conducted the A/B test, really curious to know.
- And a lot more.

8 Second task

kindly find the Attached Jupyter notebook.

9 Minimum Detectable Effect (MDE)

It's a minimum improvement over the conversion rate of the existing asset (baseline conversion rate) that you want the experiment to detect.

By setting MDE, you define the conversion rate increase sufficient for the system to declare the new asset winner. The lower MDE you set, the slighter conversion changes will be detected by the system. Basically, MDE measures the experiment sensitivity.

Highly sensitive settings, or low MDE, come along with a big sample size. The lower MDE, the more traffic you need to detect minor changes, hence the more money you have to spend on driving that traffic.

So, by configuring MDE you are flexible about connecting the experiment design with the costs you are ready to incur.

The minimum improvement over the conversion rate of the existing status quo that we want the experiment to detect is 10% (sensitivity). [5]

References

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[5] *Splitmetrics*. https://splitmetrics.com/resources/minimum-detectable-effect-mde/.

[6] *VMO*. https://vwo.com/blog/ab-testing-price-testing/.