DNSC 6290 Customer Analytics, Fall 2021

Lecture 6

Remaining Topics on Customer Analytics

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GW Business

10/7/2021

Agenda for today

- 10 min discussion from last week
- Final Tips for class Project and Q&A
- Customer Analytics at FLIPKART.com [in class case study]
- Ways to measure network effects?
- Web Competitive intelligence
- Data Visualization [Power Bi Example]
- A/B testing
- Review a typical Marketplace KPI Dashboard
- Questions on the group project

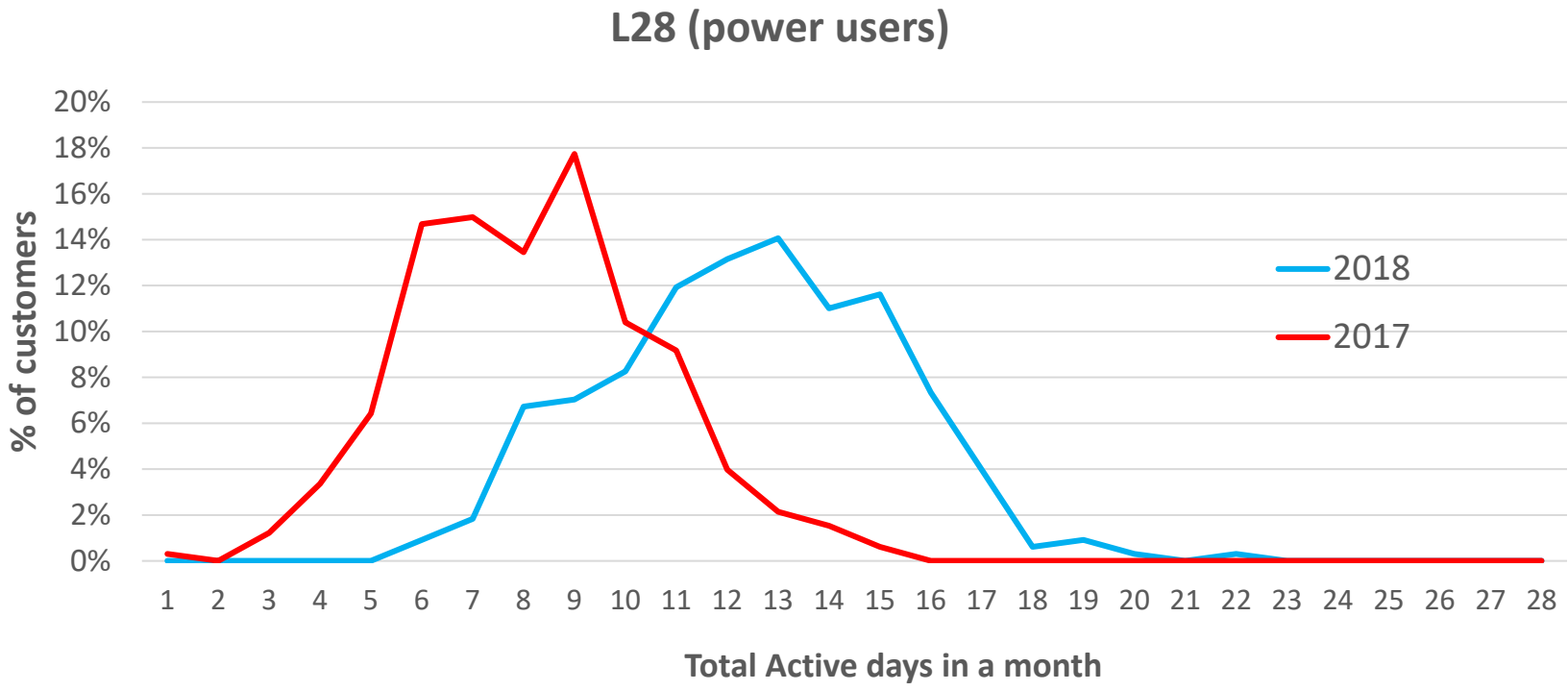
10-min round discussion for next week

- **Reading**: Calculating CLV
- **Reading:** An Introduction to Predictive Customer Lifetime Value Modeling
- **Video:** The RFM Principle Template
- **Podcast,** RFM Modeling 101: Predict Churn, Purchase, & Retention with Simple Segmentation – Caren Carrasco

Office hour moving forward

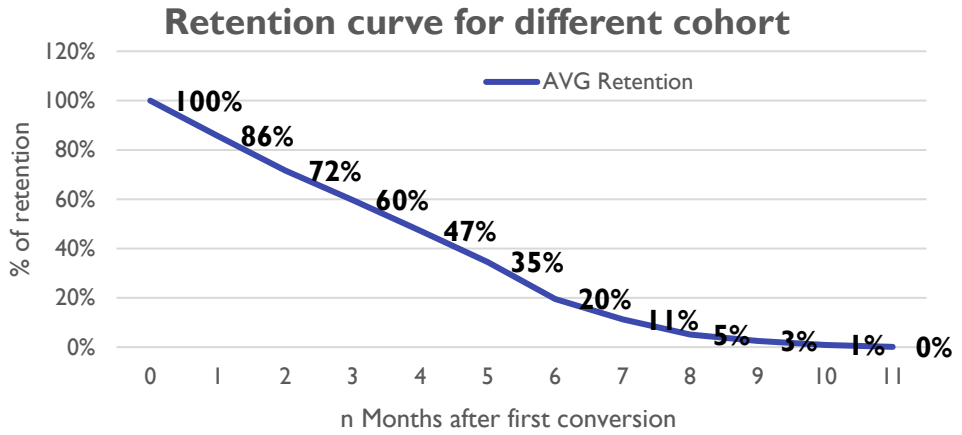
- Wednesday 7pm-8 pm EST
- Monday 7:30-8:30 am EST

HW3-Q2



AVG DAU/MAU	
29%	in 2017
44%	in 2018

HW3-Q3 a)



Month of Acquisition	New acquired Customers	Number of Users Retained 'n' Month After Conversion											
		0	1	2	3	4	5	6	7	8	9	10	11
Jan-17	500	500	480	460	450	400	330	200	150	100	90	50	10
Feb-17	540	540	500	460	430	300	190	17	100	100	60	20	
Mar-17	650	650	600	590	550	500	460	300	200	100	50		
Apr-17	630	630	589	500	470	440	400	300	150	100			
May-17	590	590	570	550	520	500	400	350	290				
Jun-17	670	670	650	620	540	520	500	370					
Jul-17	640	640	620	580	550	510	440						
Aug-17	700	700	670	633	599	550							
Sep-17	720	720	700	660	590								
Oct-17	650	650	610	590									
Nov-17	790	790	760										
Dec-17	800	800											
SUM	**7880**	**7880**	**6749**	**5643**	**4699**	**3720**	**2720**	**1537**	**890**	**400**	**200**	**70**	**10**

b)

Total Monthly Active in 2917

34518

@$10 per customer per month

$345,180

Class Project final tips

- Data Preparation Question
  - Name of categories
- Rows with 0 viewed SKUs
- 3 recommendations at most
- Project PDF submission by end of WED 2pm EST (10/13)
- One **team member** from each team **should present** the project in 25 min
  - Other members can chime in for Q&A

Flipkart.com Case study

[an Indian E-commerce]

Measuring Customer lifetime value (CLV) is challenging

We have been analyzing our data to gain insights, but, do we know the value of our customers? I think it is important for us to differentiate our customers through metrics such as customer lifetime value, which will help us to manage them effectively. For example, we can make our promotions effective if we know the customers with high customer lifetime value.

Customer lifetime value (CLV) is the net present value (NPV) of future cash flows (or profit). CLV is usually calculated at a customer segment level. The main challenge in calculating the lifetime value of customers of e-commerce companies such as Flipkart is that the exact life of the customer is unknown owing to data truncation; that is, the actual point in time of customer churn, may not be identified in e-commerce, since there would be no prior communication from the customer about the churn. Hence,

Business question for Analytics team at Flipkart

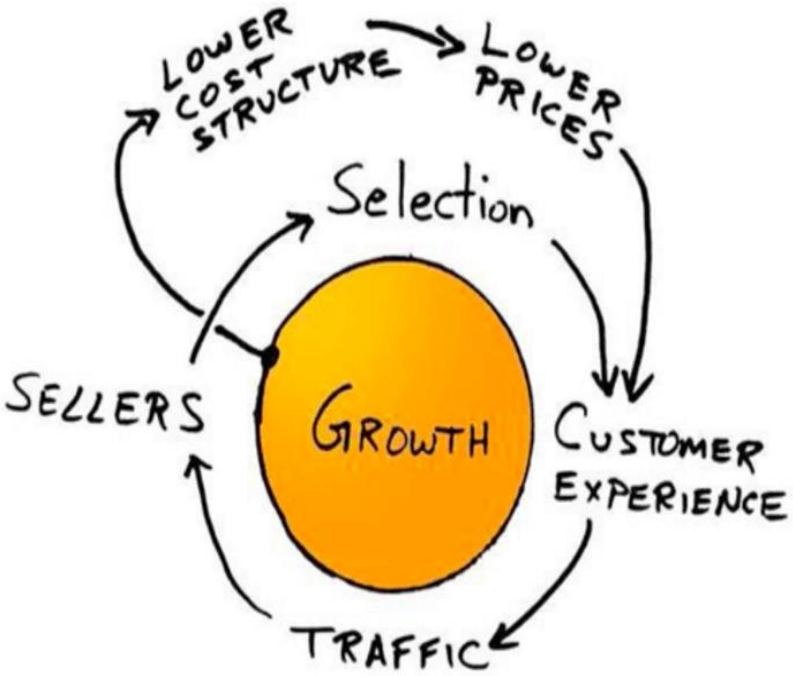
In 2015, Flipkart wanted to understand its customers better and retain most of them through effective promotions, since customer retention is less expensive as compared to customer acquisition. Unlike the churn in the telecom sector, which was clearly defined and captured (in the instance of postpaid customers), churn for e-commerce companies was difficult to define and capture, as these events were unobserved. Across e-commerce companies, the customer churn may be very high owing to reasons such as need fulfilment, cessation of demand, competition, and so on. However, it was important to capture customer churn and identify which customers should be retained.

Ways to measure network effects?

Network effect can act as the growth engine in two-sided marketplace business

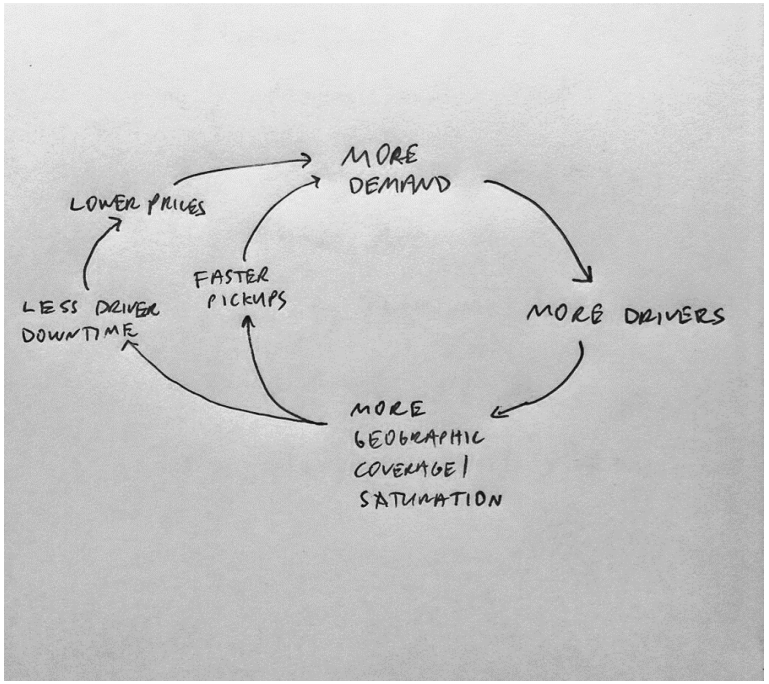
- When your product becomes more valuable as more people use it, we would have network effect business.

Amazon's Flywheel effect



amazon-flywheel-to-your-online-business/

Uber's weak network effect



Source:
https://twitter.com/davidsacks/status/475073311383105536?lang=en

There are some list of metrics which could measure and tease apart network effects

- **5 main categories to measure network effects:**

#1. Acquisition

#2. Competitors

#3. Engagement

#4. Marketplace

MARKETPLACE

#5. Economics-related

Source: https://a16z.com/2018/12/13/16-metrics-network-effects/

Acquisition-Related Metrics

#1 Organic vs. paid users

- The share of organic users relative to paid users (the ones you spend to acquire) should increase over time.
- This is because as the network grows and becomes more valuable to join

 # 2. Sources of traffic

- As the network grows, how much traffic/transactions on the network are generated internally, arising from the network itself vs. from external sources?
- More traffic coming directly suggests users are finding the network more valuable over time as it grows.

#3. Time series of paid CAC

- How much do you need to spend to acquire supply?
- While paid CAC (customer acquisition cost) should theoretically decline over time in a business once the network effects "flywheel" starts accelerating.

Source: https://a16z.com/2018/12/13/16-metrics-network-effects/

Competitor Metrics

#1 Prevalence of multi-tenanting

- How many of your users also use other similar services? How many users are active on similar services?

 # 2. Switching or multi-homing costs

- How easy is it for users to join a new (and even a non-existent) network?
- How much value can users get as a new user from joining a different network?

Source: https://a16z.com/2018/12/13/16-metrics-network-effects/

Engagement-Related Metrics

#1 User retention cohorts

- Is your user retention improving for newer cohorts?
- Newer cohorts should have better retention for any given time period than older cohorts that joined when the network was smaller.

 # 2. Dollar retention & paid user retention cohorts

- Are newer cohorts retaining better on a dollar basis, for every given time period, than older cohorts?
- Subscription and paid products need to pay attention to dollar retention and paid user retention

#3. Power user curves (aka L7 & L30 charts)

- Are users shifting to the right side of the power user curve? In other words, are they becoming more engaged over time?

Source: https://a16z.com/2018/12/13/16-metrics-network-effects/

Marketplace-Related Metrics

#1 Match rate (aka utilization rate, success rate)

- How successfully can the two sides of the marketplace find each other?
- Driver utilization time for ridesharing — what % of the time are drivers driving around with a passenger, vs. empty?
- How often are employers filling their posted role in job marketplaces? And how often are job seekers finding jobs?

 # 2. Market depth

- Is there enough supply and does it fit users' needs?
- One of the primary jobs of any marketplace business is to reduce search costs

making it easy for participants to find and match with the other side. Failing to do this can result in a marketplace with negative network effects.

#3. Time to find a match

- How long does it take for supply and demand to match?

Economics-Related Metrics

#1 Pricing power

- As participants receive greater value from the network, they are willing to pay more to have access to network, in the form of subscriptions, listing fees, take rates, or other monetization mechanisms.

 # 2. Unit economics

- Improved network effects often appear in improved unit economics over time. This is a result of declining incentives that businesses need to offer to different sides of the market, lower share of paid users, and overall improvement in pricing power.
- CAC should decrease and the organic share of users should grow over time.

Source: https://a16z.com/2018/12/13/16-metrics-network-effects/

Web Competitive Intelligence

Web Competitive intelligence is gathering information about Competitors' Customer Analytics

Get insight into the performance of your competitors' websites traffic. Does their site receive more traffic with different marketing mix than yours? Are visitors staying on their website longer than yours?....

- SimilarWeb

- Quantcast

- Ahrefs

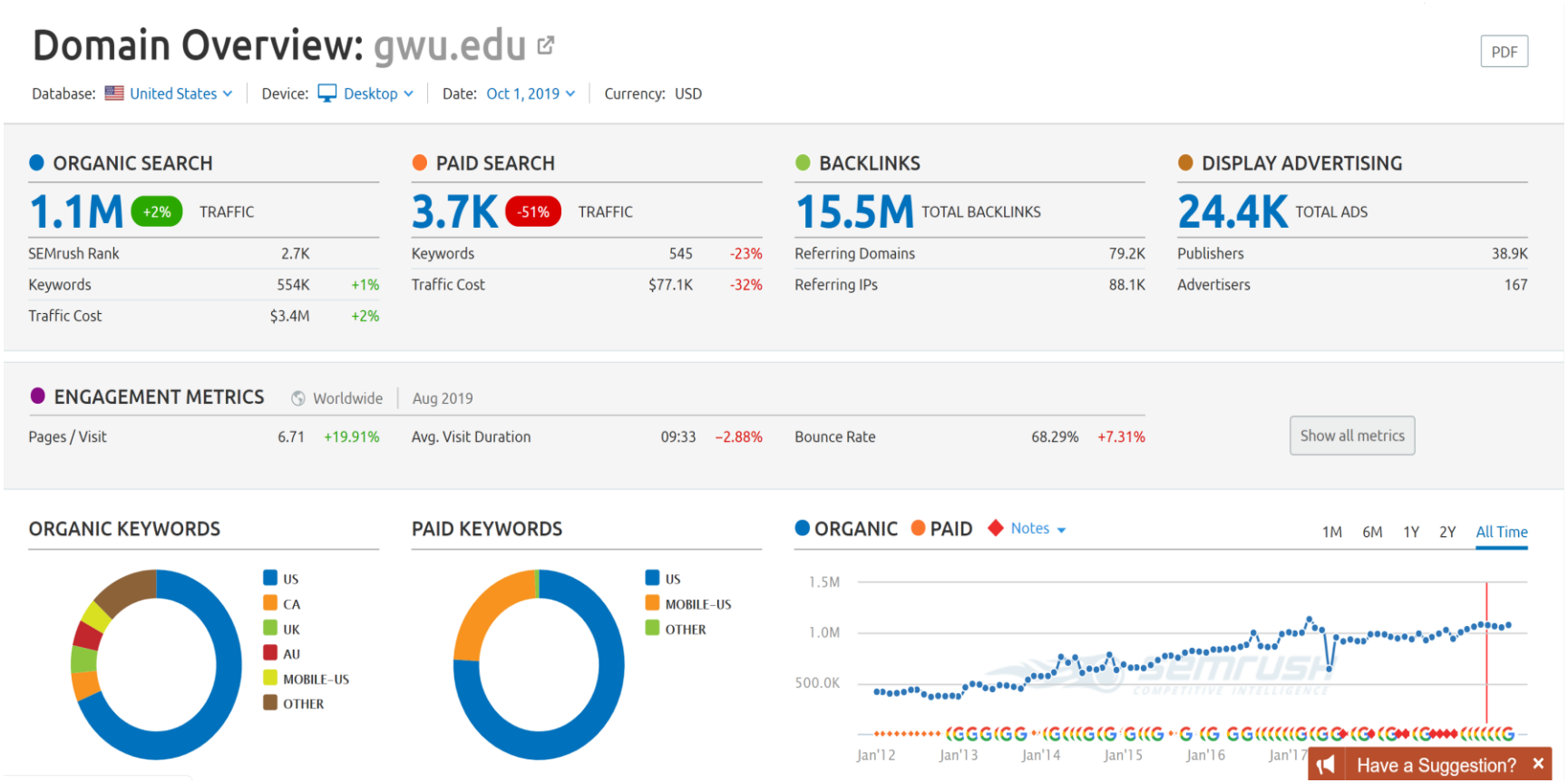
- SpyFu

- SEMrush

- Alexa

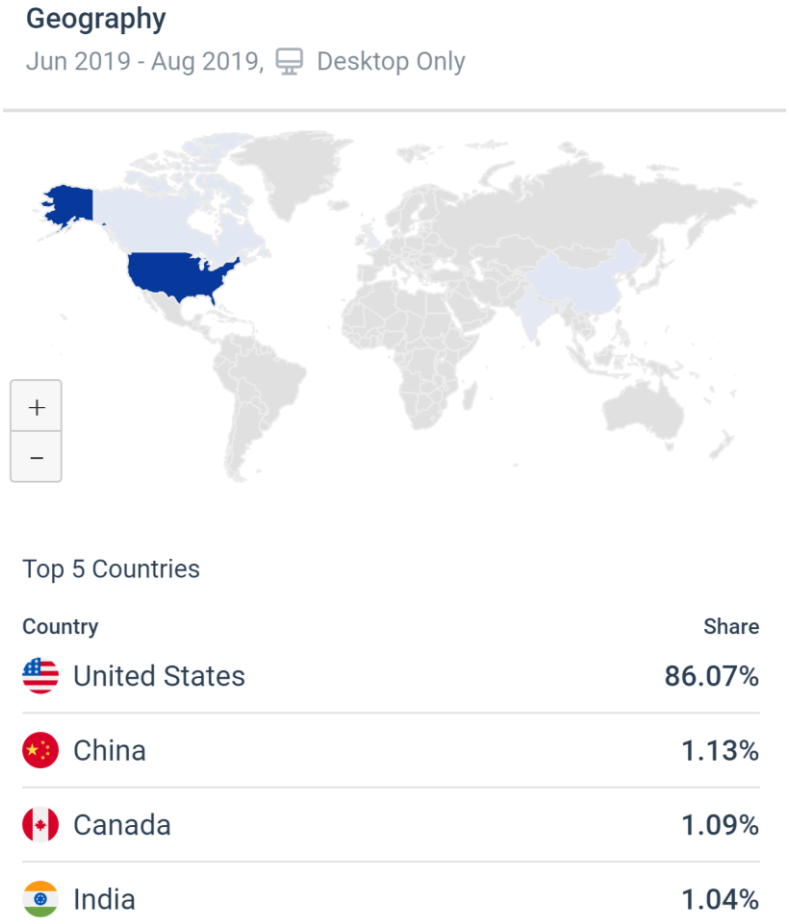
***SEMrush*, a free competitive intelligence tool**

https://www.semrush.com/



Similarweb another competitor intelligence tool

www.Similarweb.com



Data Visualization,

A picture is worth a thousand words

The power of data visualization

- Data visualization represents data in a visual context by making explicit the trends and patterns inherent in the data.

- Most tools allow the application of filters to manipulate the data as per user requirements

- With interactive visualization, you can drill down into charts and graphs for more detail, interactively changing what data you see and how it's processed.

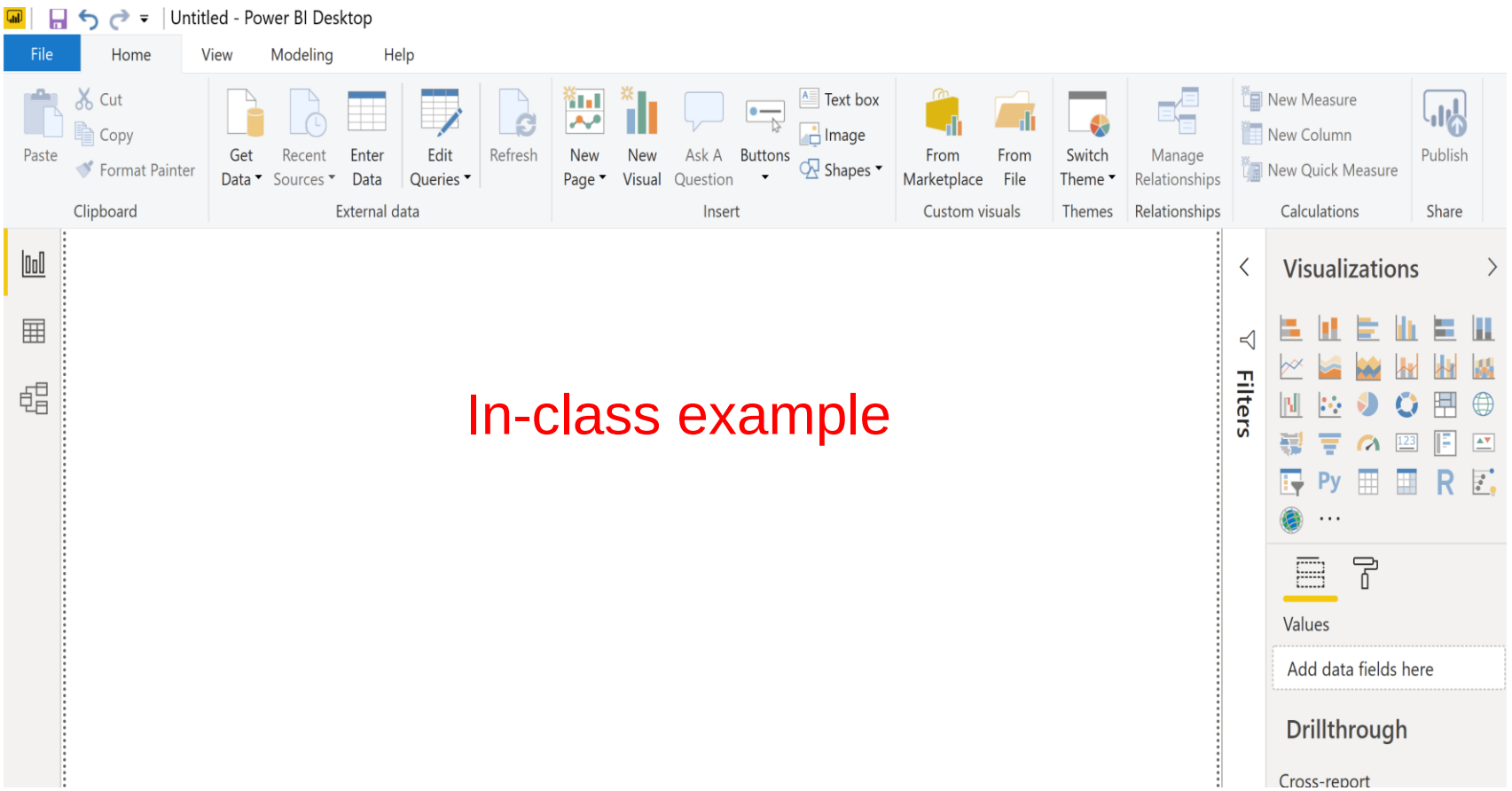
Data visualization and Business intelligence (BI) market is very competitive

How to choose the right BI partner:

- What type of questions are your business users asking?
- What is the skill level of your business users?
- What technical resources do you have ready access to?

Source Gartner 2019

You can use a free desktop version of Power BI **(Microsoft Power BI)**

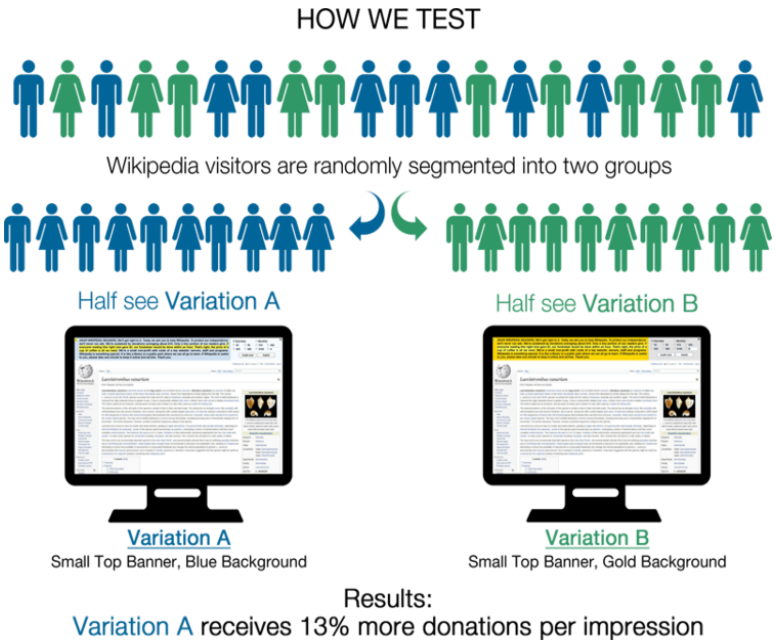


A/B testing

What is A/B Testing?

A/B testing is a method for testing different versions of the same page/call to action (CTA) at the same time to see which one produces the best outcome.

Running an experiment in comparing the performance of a control group to one or more test groups by randomly assigning each group a specific treatment.



Examples:

- Changing the subject line of a marketing email to increase number of people who open it.
- Using an image instead of a blank background.
- Redesigning mobile application to increase user activities.

How to calculate the conversion rate?

Example: You want to experiment on adding a FAQ box to the product's page to see if you can improve the conversation rate (i.e., in this example, percentage of people who purchase the product). The conversion rate for the page is defined as:

$$conversion\ rate = \frac{\#\ users\ who\ purchase\ the\ product}{\#\ total\ visitors\ to\ the\ page}$$

For example, if 100 users visit the product page and 30 of them buy the product, the conversion rate is 30%.

Experiment is run in parallel: treatments are randomly assigned to visitors.

- More uniform distribution across treatments.
- Controlling for time-dependent variables.

A/B testing example 1 [conversion: filling out the forms]

CONTROL

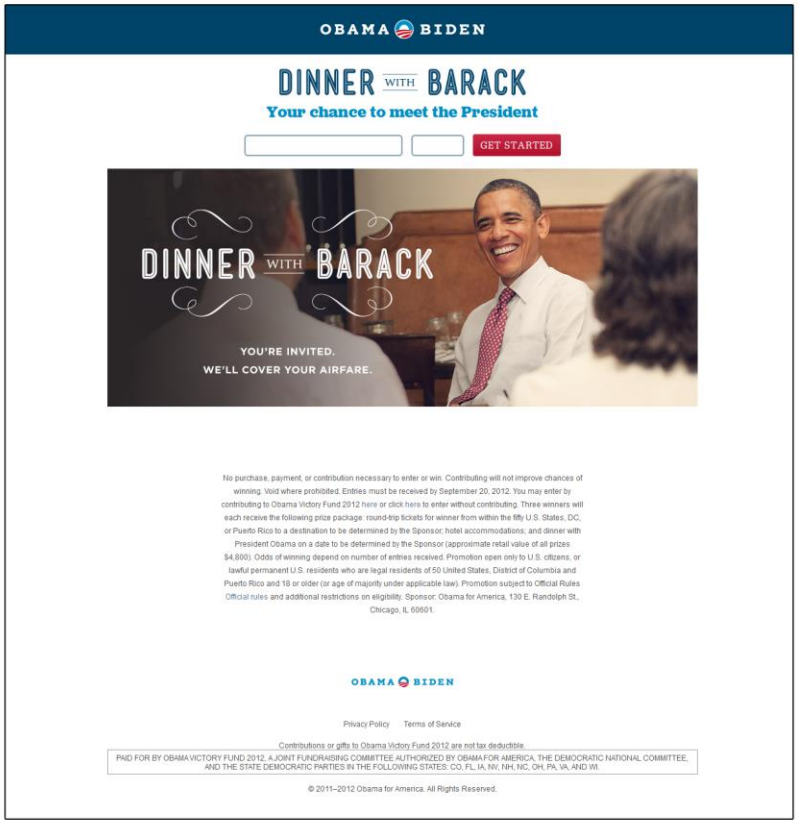
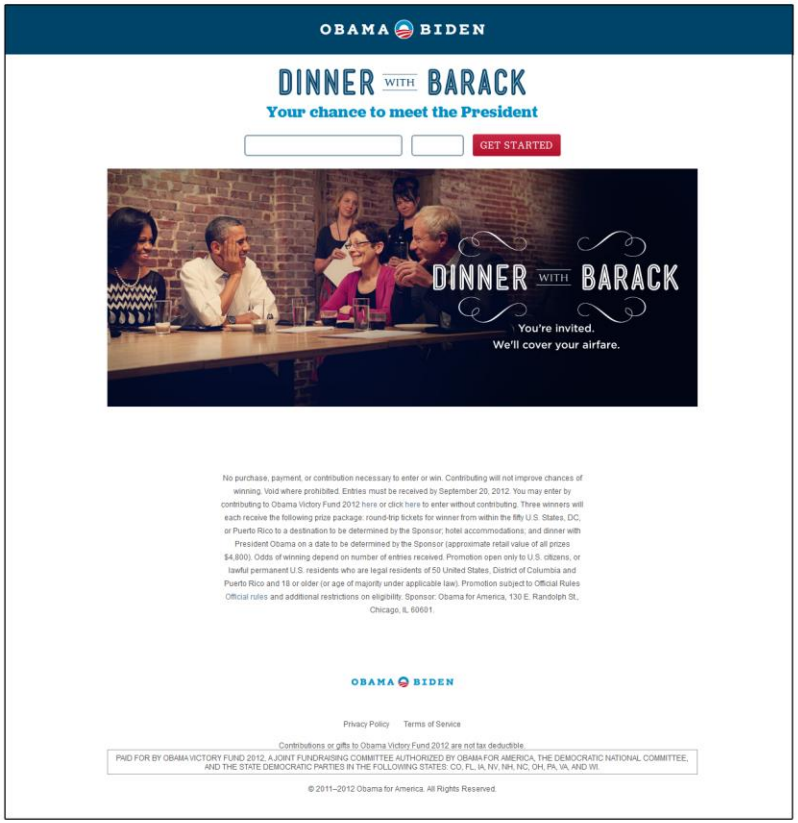


IMAGE VARIATION



⬆ +19%

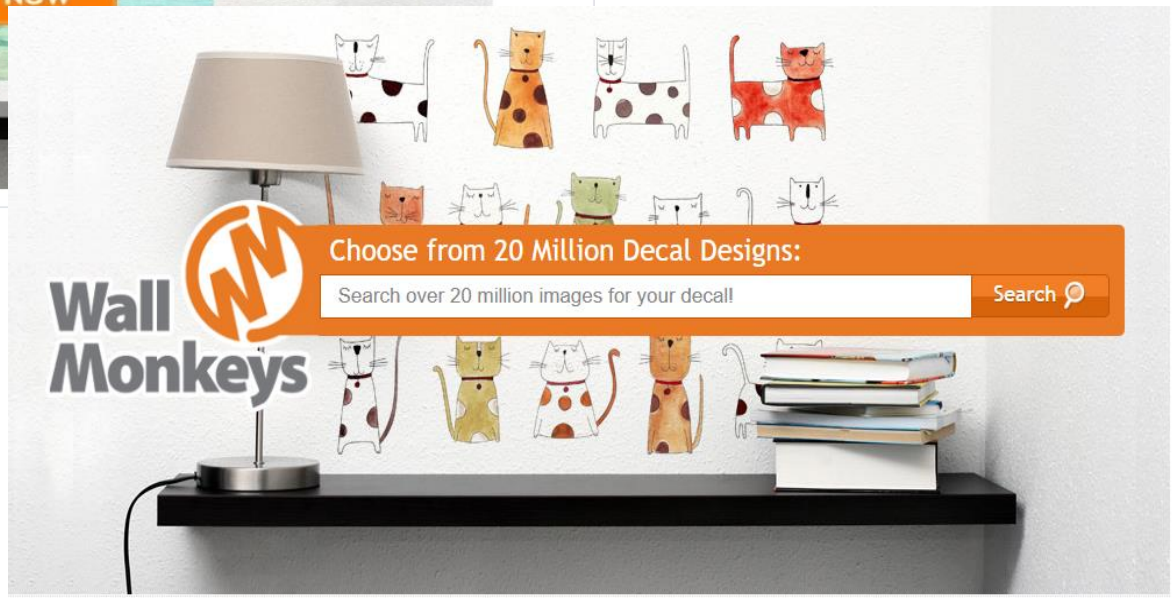
http://kylerush.net

A/B testing example 2

Control

+ 27%

Test (less distraction)



A/B testing example 3

- The initial banner had a lot of text. There was a number in the headline
- The second variation reduced the copy significantly. Additionally, the CTA changed from “Shop Medicare Plans” to “Get Started Now.

A/B testing conclusion, example 1

- We ran an experiment for few days with two treatments A and B:

	Total Visitors	Total Converted	Conversion Rate
Control	1202	278	23.12 %
Treatment A	1160	322	27.75 %
Treatment B	1254	301	24.00 %

Do we have a winner?

A/B testing conclusion, example 2

- What if the data looked like this?

	Total Visitors	Total Converted	Conversion Rate
Control	10	2	20.00 %
Treatment A	9	3	33.33 %
Treatment B	12	3	25.00 %

Do we still have a winner?

Test Hypothesis

In general, the larger the sample size, the more certain you can be about the results of the sample.

- True differences rather than just randomness/chance

How to get larger sample sizes?

- Run the experiment for longer
- Decrease the number of treatments

A test hypothesis

One-tailed test: $H_a: p_{treatment} - p_{control} > 0$

Two-tailed test: $H_a: p_{treatment} - p_{control} \neq 0$

Different Steps to run for a A/B test

Steps	Explanation	Team
Step 1: Research	Use quantitative and qualitative research to make discovery about customer experience and site friction	UX and PM
Step 2: Observe and Formulate Hypothesis	Get closer to your business goals by logging research observations and creating data-backed hypotheses aimed at increasing conversions or revenue.	PM and analytics
Step 3: Create Variations	Create a variation based on your hypothesis, and A/B test it against the existing version (control)	PM, UX, Eng
Step 4: Test planning and Run	Explore how many kinds of testing methods are there and when to use which method (A/B Testing, Multivariate Testing, Split URL Testing)	Analytics
Step 5: Result Analysis	Once your test concludes, analyze the test results by considering metrics like percentage increase, confidence level, direct and indirect impact on other metrics (cut by different segments)	Analytics
Step6: Deployment or re-test	If the test succeeds, deploy the winning variation. If the test remains inconclusive, draw insights from it, and implement these in your subsequent tests.	PM and Eng

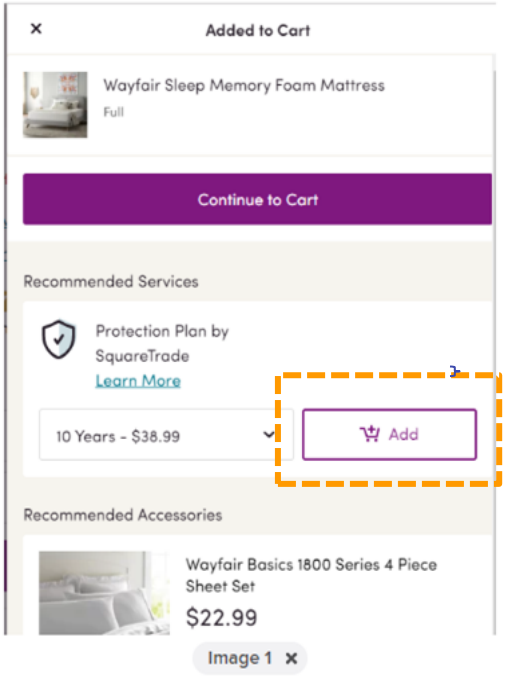
https://vwo.com/ab-testing/

A/B test hypothetical example in an E-commerce- *Hypothesis*

Formulate hypothesis and create variation(s)

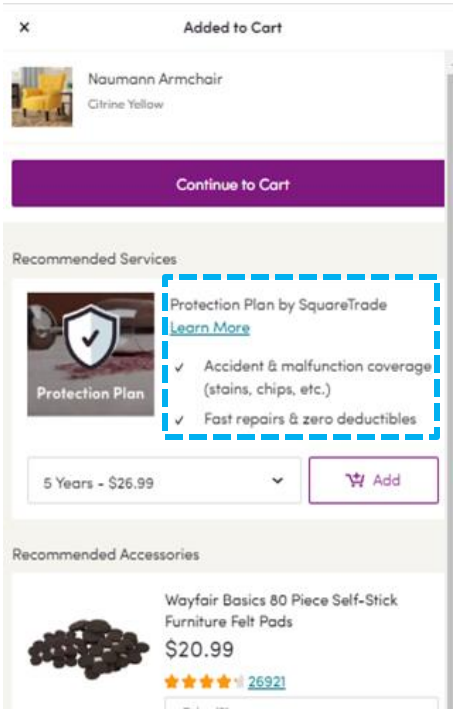
- **Hypothesis**: offer **value propositions** for protection service might increase the confidence among customers to purchase protection plan more frequently.

Control



CTA of attaching warranty to the product

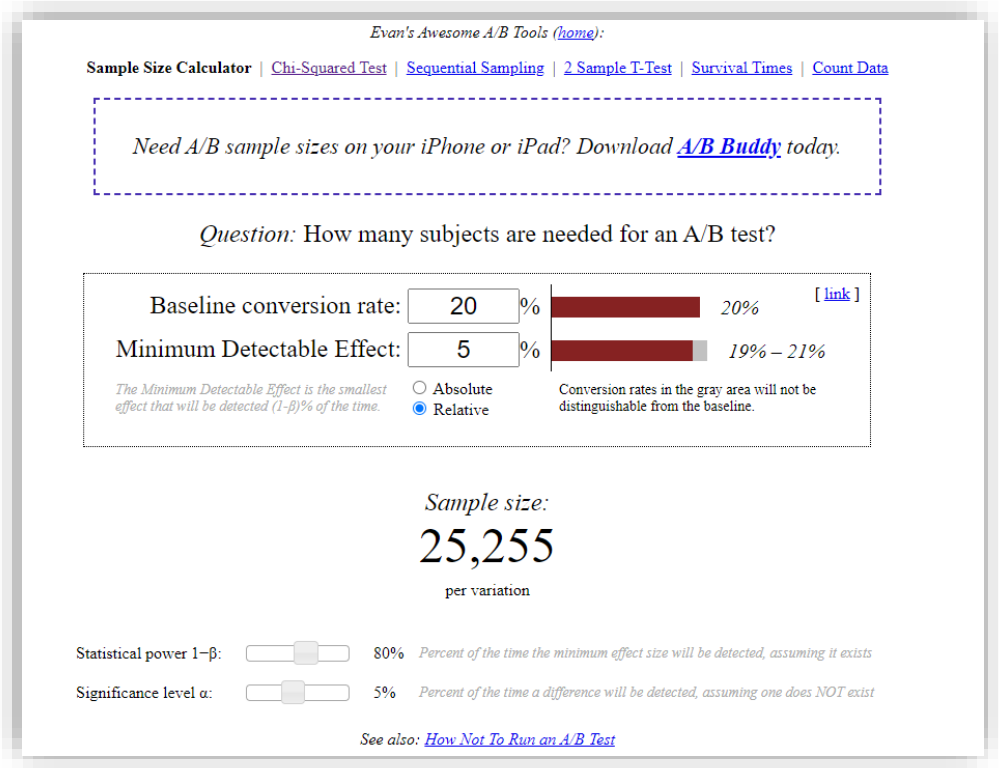
Variation 1



Offering value prop

A/B test hypothetical example in an E-commerce- *Test Planning*

Test planning: estimate the minimum number of days (or site visits) needed to reach statistically significant for primary KPI (e.g., warranty attach rate) based known parameters



https://www.evanmiller.org/ab-testing/sample-size.html

A/B test hypothetical example in an E-commerce- *Results*

Conversion Metrics (yellow color is 95% sign.)	**Base value** (control)	**Lift%** V1
Site Session conversion	9.52%	0.2%
Users conversion	39.2%	0.2%
Warranty Eligible SKU, Add to Cart rate	18.1%	0.0%
Warranty Attach Rate (primary KPI)	1.6%	9.9%

Offering value propositions will increase the warranty attach rate by 10%

This can translate into $XXX revenue and $YYY profit annually!

A/B test Example for Homepage conversion

A "Visit" is an instance of a person coming to a website

A "visitor" is a person who conducts a visit on a website

An "Order" is an instance of someone making a purchase

"Conversion rate" is defined as the number or orders per visit

The home page of a web site can be "split" into two versions ("A" and "B") that have different characteristics (e.g., layout, products, etc.)

- These different versions can then be shown to different visitors on a random basis

Problem: You are determining which home page version is the best choice for the site to maximize the number of orders.

A/B test Example for Homepage conversion, Cont.

- **Note 1:** A two-week split test was set up where visitors were randomly (but not necessarily equally) assigned to one home page or another, and the number of visitors to each homepage and the related orders were accurately recorded by day.

- **Note 2:** The additional traffic on the 7th and 14th is due to some banner ads running on Facebook on those particular days.

	Homepage Version A		Homepage version B	
	Visits	Orders	Visits	Orders
06/04/07	7,823	796	2,910	289
06/05/07	5,611	541	3,049	262
06/06/07	5,092	533	2,775	280
06/07/07	16,407	1,001	3,266	191
06/08/07	4,072	416	1,980	188
06/09/07	2,802	268	1,512	129
06/10/07	3,277	323	1,408	134
06/11/07	8,159	808	2,709	258
06/12/07	5,331	517	2,802	258
06/13/07	5,217	542	2,720	272
06/14/07	15,922	1,099	3,119	205
06/15/07	4,360	415	2,091	182
Totals:	**84,073**	**7,259**	**30,341**	**2,648**

A/B test Example for Homepage conversion, Cont.

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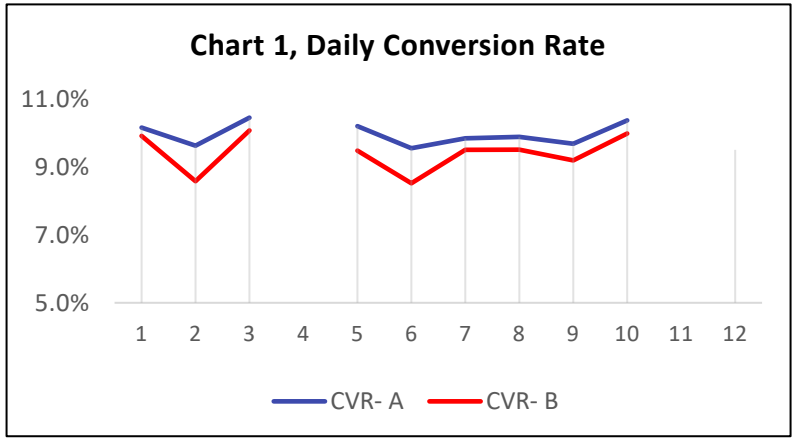
	Totals:	**84,073**	**7,259**	**30,341**	**2,648**

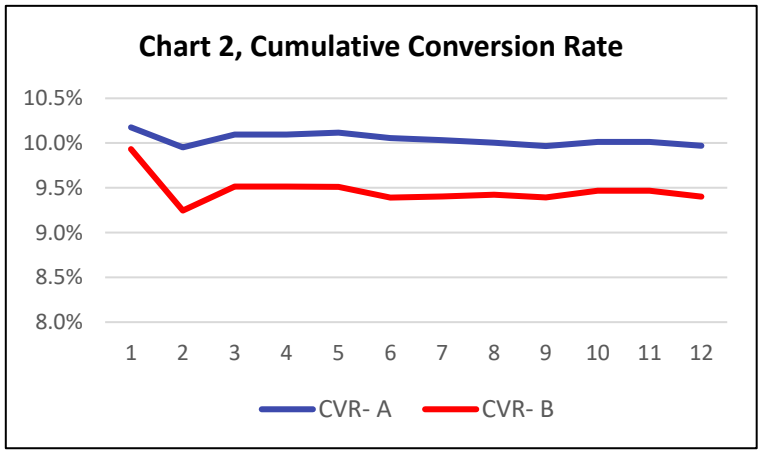
A/B test Example for Homepage conversion, Cont.

	Daily		
	CVR- A	CVR- B	lift%
06/04/07	10.2%	9.9%	-2.4%
06/05/07	9.6%	8.6%	-10.9%
06/06/07	10.5%	10.1%	-3.6%
06/07/07			
06/08/07	10.2%	9.5%	-7.1%
06/09/07	9.6%	8.5%	-10.8%
06/10/07	9.9%	9.5%	-3.4%
06/11/07	9.9%	9.5%	-3.8%
06/12/07	9.7%	9.2%	-5.1%
06/13/07	10.4%	10.0%	-3.7%
06/14/07			
06/15/07	9.5%	8.7%	-8.6%
Totals:	8.6%	8.7%	1.1%

Directionally **A** is **better than B,** without calculating the p-value (significance for AB test)

	Cumulative		
	CVR- A	CVR- B	lift%
06/04/07	10.2%	9.9%	-2.4%
06/05/07	10.0%	9.2%	-7.1%
06/06/07	10.1%	9.5%	-5.7%
06/07/07	10.1%	9.5%	-5.7%
06/08/07	10.1%	9.5%	-6.0%
06/09/07	10.1%	9.4%	-6.6%
06/10/07	10.0%	9.4%	-6.3%
06/11/07	10.0%	9.4%	-5.8%
06/12/07	10.0%	9.4%	-5.8%
06/13/07	10.0%	9.5%	-5.4%
06/14/07	10.0%	9.5%	-5.4%
06/15/07	10.0%	9.4%	-5.7%
Totals:	**10.0%**	**9.4%**	**-5.7%**





A/B test Example for Homepage conversion, Cont.

What is a little strange about this data? Why is this happening?

- This is a very clean data where Home page A is winning regardless. Anything else you can think of?

- Anything else you would do to increase your confidence?

A Marketplace KPI Dashboard

Tracking the marketplace KPIs on monthly/quarterly basis

Overall Marketplace Metrics
Gross Merchandise Volume (GMV) ($)
# of Transactions
Average Order Value (AOV) ($)
GMV Growth Rate, M-o-M (%)
GMV Growth Rate, Y-o-Y (%)
Take Rate (%)
Revenue ($)
Revenue from transaction fees ($)
Revenue from listing fees ($)
Revenue from supplier or seller services ($)
Buyer-to-Seller Ratio
Total CAC as a percentage of Revenue (%)

Buyer Metrics
Total # of Buyers
# of New Buyers
Buyer Growth Rate, M-o-M (%)
Buyer Growth Rate, Y-o-Y (%)
Percentage of Buyers who have purchased more than once (%)
Percentage of GMV from Buyers who purchased in previous months (%)
Percentage of Buyers whose second purchase is in a different category (%)
Average amount purchased per Buyer ($)
Average # of Orders per Buyer
Average Order Growth per Buyer, Y-o-Y
Average percentage of Month 1 GMV generated by Buyers in Month 12 (%)
Percentage of revenue generated by Top 20% Buyers (%)
Buyer NPS
Buyer CAC (paid and organic) ($)
Buyer CAC (paid) ($)
Percentage of Buyers acquired through paid acquisition (%)

Seller / Supplier Metrics
Total # of Sellers or Suppliers
# of New Sellers or Suppliers
Seller or Supplier Growth Rate, M-o-M (%)
Seller or Supplier Growth Rate, Y-o-Y (%)
Percentage of Sellers or Suppliers still active after 1 month (%)
Percentage of Sellers or Suppliers still active after 1 year (%)
Average revenue generated per Seller or Supplier ($)
Average percentage of Month 1 GMV generated by Sellers or Suppliers in Month 12 (%)
Percentage of revenue generated by Top 20% Sellers or Suppliers (%)
Seller or Supplier NPS
Seller or Supplier CAC (paid and organic) ($)
Seller or Supplier CAC (paid) ($)
Percentage of Sellers or Suppliers acquired through paid acquisition (%)
Total # of Listings
# of New Listings
Listings Growth Rate (%)

https://docs.google.com/spreadsheets/d/1MJFOOV_pBahXVgPXNC5T9LoQlyYxyNawpt7MTWFp97k/edit#gid=1569059121

Sample for SAS Metrics Dashboard

SaaS Metrics Dashboard

A simple KPI sheet for early-stage SaaS startups with a low-touch sales model.

	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Total 2013
VISITORS & SIGNUPS													
Visitors 1)	2,456	2,687	2,986	2,897	3,012								
m/m growth visitors		*9.41%*	*11.13%*	*-2.98%*	*3.97%*								
Signups beginning of the month 2)	245	388	566	752	919								
New signups													
Organic	61	122	97	75	121								
Paid	82	56	89	92	78								
Total new signups	**143**	**178**	**186**	**167**	**199**								
m/m growth new signups		*24.48%*	*4.49%*	*-10.22%*	*19.16%*								
Visitor-to-Signup Conversion Rate	**5.82%**	**6.62%**	**6.23%**	**5.76%**	**6.61%**								
Signups end of month	388	566	752	919	1,118								
PAYING CUSTOMERS 3)													
Customers beginning of the month	35	54	74	95	119								
New customers	20	22	24	26	23								
Conversion rate 4)		**15.38%**	**13.48%**	**13.98%**	**13.77%**								
Lost customers	-1	-2	-3	-2	-3								
Churn rate	**2.86%**	**3.70%**	**4.05%**	**2.11%**	**2.52%**								
Net new customers	**19**	**20**	**21**	**24**	**20**								
Customers end of month	54	74	95	119	139								
m/m growth customers		*37.04%*	*28.38%*	*25.26%*	*16.81%*								
MRR													
MRR beginning of the month	$3,000	$5,127	$7,499	$9,905	$13,067								
New MRR													
New MRR from new customers	$1,980	$2,209	$2,450	$2,889	$2,560								
New MRR from account expansions 5)	$245	$343	$230	$459	$389								
Total new MRR	$2,225	$2,552	$2,680	$3,348	$2,949								
Lost MRR 6)	-$98	-$180	-$274	-$186	-$256								
MRR churn rate 7)	**3.27%**	**3.51%**	**3.65%**	**1.88%**	**1.96%**								
Net new MRR	**$2,127**	**$2,372**	**$2,406**	**$3,162**	**$2,693**								
MRR end of month	**$5,127**	**$7,499**	**$9,905**	**$13,067**	**$15,760**								
m/m growth MRR		*46.26%*	*32.08%*	*31.92%*	*20.61%*								

https://docs.google.com/spreadsheets/d/19Rm_tNMTJ9vucTFleS_ojWyudilSuND-bNTYRMHvT64/edit#gid=0

https://davidcummings.org/2013/11/04/cohort-analysis-for-analyzing-saas-churn/

Reading/listening

Relevant readings, articles, podcasts and videos

10-min round discussion for next week

- **Reading**: 16 Ways to Measure Network Effects
- **Reading:** The Network Effects Bible
- **Reading:** Your Step-by-Step Guide to A/B Testing with Google Optimize
- Reading: The Complete Guide To A/B Testing
- **Reading:** 16 Startup Metrics

Extra interesting and relevant content

- **Reading**: 3 A/B Testing Examples That You Should Steal [Case Studies]
- **Video:** SEMRush Review: Step-By-Step Guide to Using SEMRush + 30-Day Free Trial
- **Reading:** calculating CLV

Questions

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