

## Class 11 Case Study: Improve User Engagement on Social Media Platforms

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## Section 1

# Procedures of A/B Testings

## Motivating Example with Tom's Loyalty Program

- Tom is considering whether or not to introduce a loyalty program for his bubble tea business. This decision is essentially a cost-benefit analysis
  - Cost: it takes money and time to develop the loyalty program
  - Benefit: it may increase spending and retention rate, and hence future CLV
- Cost can be estimated through budgeting, but how to estimate the benefit from introducing LP?

## Step 1: Decide on the Unit of Randomization

We decide **the granularity of randomization unit** based on the research question at hand.

- **individual** (often chosen)
- household
- store
- others even more granular (e.g., device level) or even less granular (e.g., city level)

# Step 1: Decide on the Unit of Randomization

**Proposal 1:** Randomize the loyalty program to West London and East London.

- Do you expect the “randomize” to be true randomization?<sup>1</sup>

**Proposal 2:** Randomize the loyalty program among individual customers.

- Is this true randomization?
- What problems can we still have?

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<sup>1</sup>All answers to questions in the slides are on the webpage version of lecture notes.

# Step 1: Pros and Cons of Granularity

## Disadvantages of granularity:

- Costs and logistics
- Spillovers and crossovers

## Advantages of granularity:

- Increase the chance of successful randomization, thereby mitigating any systematic unbalance of covariates before the experiment.

## Exercise:

- How can we randomize individualized price discounts to customers?

## Step 2: Mitigate Spillover and Crossover Effects

- **Crossover Effects:** A crossover occurs when an individual who was supposed to be assigned to one treatment is accidentally exposed to another or more treatments.
  - e.g., For online A/B testing, a notorious crossover effect is that when browsers reset the cookies, the same individual customer may be treated as a different new customer.
- **Spillover effects:** The behavior of the treatment group can affect control group as well
  - e.g., customers may share the promotions with family members and friends.

**Question:** How should Tom mitigate spillover and crossover effects?

## Step 3: Decide on Randomization Allocation Scheme

- Individuals (or the relevant unit of randomization) are allocated at random into a treatment condition based on some decision rules.
- Due to the high costs and potential risks of A/B testing, we often select a small percentage of customers into the treatment condition, while the remaining customer should do “business-as-usual”.



## Step 4: Collect Data

- Any field experiment should be aware of the need for a sufficiently large sample size, or sufficient statistical power.
  - The larger sample size, the higher statistical power for the experiment; meanwhile, larger sample size brings higher costs and risks.
  - Run a [power calculation in R](#)
- Collect both data on the outcome variables of interest and consumer characteristics data

**Proposal:** We need to collect customers' retention rate data and link the retention data with their treatment assignment.

## Step 5: Interpreting Results from a Field Experiment

### Step 5.1: Randomization check

- We need to check if the treatment group and control group are well-balanced in terms of their **pre-treatment** characteristics, especially the outcome variables.

### Step 5.2: Analyze the data and estimate the ATE

- **t-test** to examine the difference in the average outcome between the treatment group and control group. In R, we can use `t.test()`
- **Regression analysis** when analyzing A/B/N testing or multivariate experiments.

## Section 2

### Case Background

# Situation Analysis

- Business model of Twitter, and other social media platforms in general?
- How does Twitter make money?
- Who are Twitter's customers?
- Who are the collaborators of Twitter?
- Who are Twitter's direct and indirect competitors?
- Which PESTLE factors should we focus on?

# Business Objective

*[...] we are going to draw upon **social comparison theory** and **gamification** to help Twitter further improve its user engagement in its newly introduced feature called “Communities” on the platform. “Communities” is a twitter feature that aims to enrich user engagement by catering to specific interests and subjects. These Communities offer users a dedicated space to convene around shared topics of interest, spanning domains such as celebrity fandoms, movie enthusiasts, and various hobbies.*

# Theoretical Motivation

When proposing business ideas, we should base our proposals on scientific, well-established theories from different disciplines such as Psychology and Behavioral Economics:

- Social comparison theory (Twitter's case study)
- Framing effect
- Prospect theory
- Bandwagon effect

# Business Proposal

- We propose to implement a leaderboard to rank different communities based on points based on **Gamification Theory** and **Social Comparison Theory**.

## Daily Task



Login for two days in a row

Today's points +5

Get points



Login the App

+10 points for login to APP daily,  
view instructions >

Get points



Checkin at the Communities

+1 point/time, 8 points limit daily

Get points



Retweet or comment a post

+2 points/time, 16 points limit daily

Get points



TaylorSwift

100m points

Join



LadyGaga

91m points

Join



TroyeSivan

82m points

Join



SelenaGomez

78m points

Join



BillieEilish

73m points

Join

## Section 3

# A/B Testing for Twitter



## Step 1: Decide on the Unit of Randomization

- What would be the best unit of randomization?

## Step 2: Mitigate Spillover and Crossover Effects

- What are the potential problems for spillover and crossover?

## Step 3: Decide on Randomization Allocation Scheme

- How should we determine the randomization scheme?

## Step 4: Collect Data

- What is the sample size we need?
- What data should we collect?

## Step 5: Data analytics

- Randomization checks
- How to estimate the treatment effects?