GG E-Commerce Experiment

Group 6

1. **Angelita**   **P_G2DA4088**
2. **Asfilia Nova A**   **P_G2DA4136**
3. **Dimas Wahyu S**   **P_G2DA4032**
4. **Rahmatsyah Firdaus** **P_G2DA4176**

Members

Study Case

GG e-commerce is **trying to sell more online classes**, they want to perform a new process on a landing page on their website.

- For the old page they only have "Start Free Trial", where students will be asked for credit card information, then they will enroll in a free trial in 14 days. After 14 days, they will be charged unless they cancel.

- On the new page, students will see "Access Course Materials", where students can access videos and learning materials without any credit card information. After 14 days, they will get notification to upgrade their account to a paid version if they want to continue studying.

Which page leads to better conversion?

To increase online classes sales by 35% within 3 month.

The sales of the online classes tend to decrease by 30% over the past 3 months.

Root Cause Analysis

- Users don't have credit card.
- Users don't get access to the course material before filling the credit card information.

Problem Statement

Users don't have access to course materials, unless they have a credit card to enroll in a free trial

Proposed Solution

Generate new web page where students can access videos and learning materials without credit card information. After 14 days, they will get notification to upgrade their account to a paid version if they want to continue studying.

Then, run an experimental test using **a/b testing** method to identify if a new web page will increase the conversion rate statistically significant or not.

Key Metric, Population, & Business Hypothesis

- **Key metric**

  Conversion rate

- **Population**

  All users who already have account in the website

- **Business Hypothesis**

  The new page of the website will increase the conversion rate of the online classes sales

Hypothesis

Null Hypothesis

Probability of conversion in the control group = probability of conversion in the treatment group

Alternative hypothesis

Probability of conversion in the control group ≠ probability of conversion in the treatment group

Experiment Groups and Period

Control = Users who exposed with the old page

Experiment = Users who exposed with the new page

Period = 23 days

Users of control group = 147202

Users of treatment group = 147276

Experiment Monitoring

Conversion Dashboard which consists of :

- Total number of visitors who seen the old page and new page
- Total sales from each group
- Total users who converted and not converted
- Conversion rate from each group

1. **Sum of users in each groups who converted and not converted**

	Converted	Not Converted	Total
Control	17723	129479	147202
Treatment	17514	129762	147276
Total	35237	259241	294478

Conversion on All Group
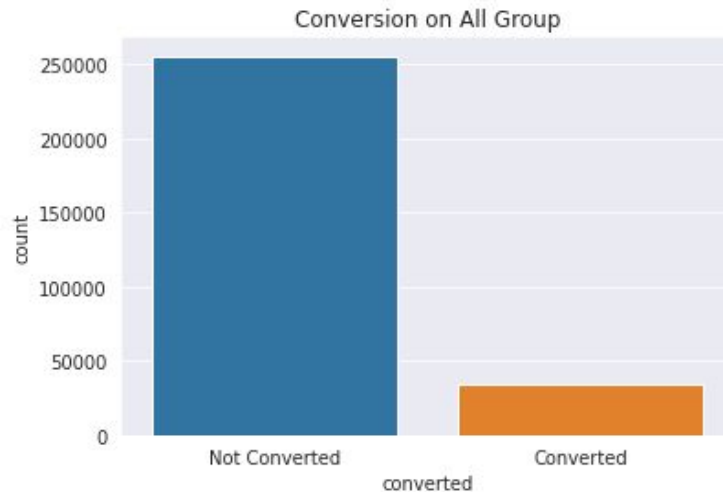
Control Group

date	converted sum
2017-01-02	355
2017-01-03	751
2017-01-04	800
2017-01-05	791
2017-01-06	769
2017-01-07	793
2017-01-08	795
2017-01-09	788
2017-01-10	757
2017-01-11	794
2017-01-12	793
2017-01-13	769
2017-01-14	829
2017-01-15	805
2017-01-16	807
2017-01-17	812
2017-01-18	803
2017-01-19	786
2017-01-20	748
2017-01-21	848
2017-01-22	785
2017-01-23	849
2017-01-24	444

1. Minimum conversion = 355

2. Maximum conversion = 849

Treatment Group

date	converted sum
2017-01-02	342
2017-01-03	751
2017-01-04	763
2017-01-05	744
2017-01-06	834
2017-01-07	768
2017-01-08	814
2017-01-09	785
2017-01-10	850
2017-01-11	775
2017-01-12	807
2017-01-13	725
2017-01-14	791
2017-01-15	747
2017-01-16	784
2017-01-17	833
2017-01-18	821
2017-01-19	763
2017-01-20	788
2017-01-21	759
2017-01-22	783
2017-01-23	807
2017-01-24	440

1. Minimum conversion = 342

2. Maximum conversion = 850

Conversion Rate

1. **Conversion rate of control group**

   = $\dfrac{\text{users in control group who converted}}{\text{Total users in control group}}$ = 0.1204

2. **Conversion rate of treatment group**

   = $\dfrac{\text{users in treatment group who converted}}{\text{Total users in treatment group}}$ = 0.1188

Hypothesis for Two Sample Z-Test

$$\begin{cases} H_0: p_{con} = p_{exp} \\ H_1: p_{con} \neq p_{exp} \end{cases}$$

Two Sample Z-Test Calculation

1. Calculate the probability of users converted

$$\widehat{P}_{con} = \frac{X_{con}}{N_{con}} = 0.1204$$

$$\widehat{P}_{exp} = \frac{X_{exp}}{N_{exp}} = 0.1188$$

2. Calculate pooled probability

$$\widehat{P}_{pooled} = \frac{X_{con} + X_{exp}}{N_{con} + N_{exp}} = 0.1196$$

3. Calculate pooled variance

$$\widehat{S}^2_{pooled} = \widehat{P}_{pooled}(1 - \widehat{P}_{pooled}) * (\frac{1}{N_{con}} + \frac{1}{N_{exp}})$$

$$= 1.44940e\text{-}06$$

4. Calculate standard error

$$SE = \sqrt{\widehat{S}^2_{pooled}} = 0.0012$$

4. Calculate Test Statistics

$$T = \frac{\hat{p}_{con} - \hat{p}_{exp}}{\sqrt{\hat{S}^2{}_{pooled}}}$$ = 1.2369

4. Z-Critical Value (alpha = 0.05)

$$z_{1-\frac{\alpha}{2}}$$ = 1.9599

$$Accept\ H_0: \quad -z_{1-\alpha/2} \leq T \leq z_{1-\alpha/2}$$

$$Reject\ H_0: \quad T < -z_{1-\alpha/2}\ or\ T > z_{1-\alpha/2}$$

$$Accept\ H_0: \quad -1.96 \leq T \leq 1.96$$

$$Reject\ H_0: \quad T < -1.96\ or\ T > 1.96$$

$$Conclusion, Accept\ H_0$$

```python
from statsmodels.stats.proportion import proportions_ztest, proportion_confint
control_results = data[data['group'] == 'control']['converted']
treatment_results = data[data['group'] == 'treatment']['converted']
n_con = control_results.count()
n_treat = treatment_results.count()
successes = [control_results.sum(), treatment_results.sum()]
nobs = [n_con, n_treat]

z_stat, pval = proportions_ztest(successes, nobs=nobs)
(lower_con, lower_treat), (upper_con, upper_treat) = proportion_confint(successes, nobs=nobs, alpha=0.05)

print(f'z statistic: {z_stat:.4f}')
print(f'p-value: {pval:.4f}')
print(f'ci 95% for control group: [{lower_con:.3f}, {upper_con:.4f}]')
print(f'ci 95% for treatment group: [{lower_treat:.3f}, {upper_treat:.4f}]')
```

```
z statistic: 1.2369
p-value: 0.2161
ci 95% for control group: [0.119, 0.1221]
ci 95% for treatment group: [0.117, 0.1206]
```

p value = 0.2161 > 0.05, so we can't reject null hypothesis

Action Plan

From the results of the experiment, **new page didn't perform significantly different than our old one**. The new page is not likely to be an improvement on our old page. So, we can't implement the new page to our website. We are planning to propose a other approach like **coupons code and advertisement**. Then, do the experiment test again until we can improve the conversion rate.

References

https://towardsdatascience.com/simple-and-complet-guide-to-a-b-testing-c34154d0ce5a

https://bondicrypto.medium.com/implementing-a-b-tests-in-python-514e9eb5b3a1

https://github.com/bondicrypto/AB_Testing/blob/master/AB_Testing.ipynb

https://towardsdatascience.com/ab-testing-with-python-e5964dd66143