Project Submission - A/B Testing at GloBox

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Executive Summery

Our expansion into the food and drinks industry has shown limited customer engagement, prompting proactive measures to boost sales. A targeted marketing approach using a homepage banner significantly increased the conversion rate, but the average spending per user remained unchanged, indicating potential pricing challenges in the sector. Additionally, a prominent novelty effect observed suggests that users are not returning customers, questioning the sector's appeal to our user base. Notably, the North American market emerged as the most valuable, warranting special attention for future growth opportunities.

Main Points:

1. Expansion into food and drinks industry yielded limited customer engagement and exposure.
2. Significant increase in conversion rate, but average spending per user remained unchanged, across genders and phone operating systems.
3. Novelty effect observed, indicating potential short-lived interest of users in the new sector.
4. North American market demonstrated relatively higher rates, highlighting growth potential in that region.

Intro

The expansion of our business into the food and drinks industry has yielded limited customer engagement and exposure thus far. However, recognizing the potential for growth in this field, we have taken proactive measures to bolster our presence and drive sales. We have strategically designed a banner at the top of our app's homepage that invites users to explore the food and drinks section (see appendix a). This targeted marketing approach aims to capture the attention of users and encourage them to discover our range of products and services.

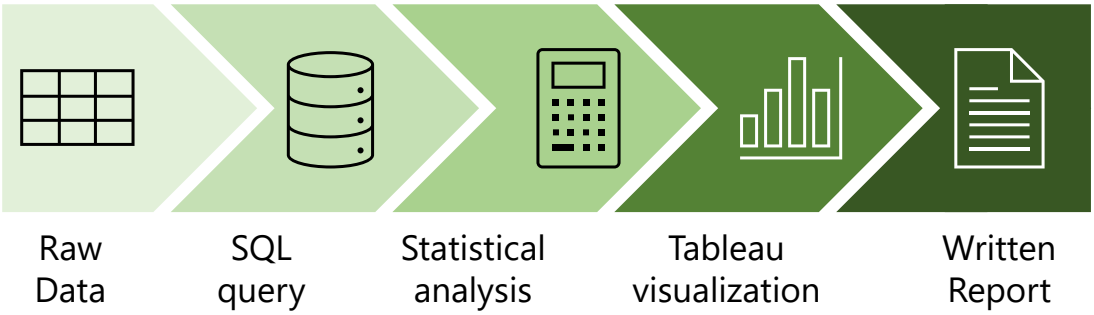
This is a critical step in generating interest and driving sales, as consumers are more likely to make purchases when presented with convenient and accessible options.

Our activity has spread into the food and drinks field, but with a rather small engagement and exposure to the customers.

Test Method

The user groups were randomly assigned to either a control group (A), which was shown the previous homepage without the banner, or a treatment group (B), which was exposed to the new banner. The experiment was conducted over a period of 12 days[1], during which data was collected on user spending as well as demographic and technical characteristics such as gender, country, and cell operating system.

The analysis flow:



To analyze the results, SQL queries were designed to aggregate the raw data and conduct statistical calculations, which were then used to support our business conclusions regarding the implementation's correlation to increased sales and retention rates. The statistical calculations were performed using spreadsheets, and the results were visualized using Tableau and presented to our team.

The use of SQL queries allowed us to efficiently and accurately analyze the data collected during the experiment, enabling us to draw meaningful conclusions about the efficacy of the banner. These queries are included in appendix B for reference.

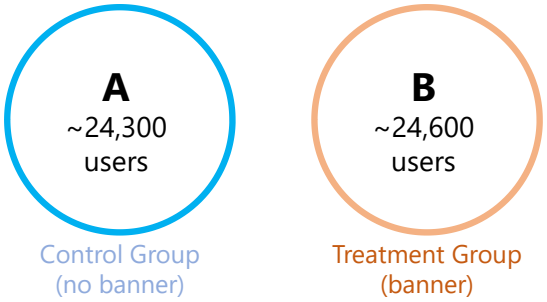
These results provide valuable insights for our business decisions and strategies moving forward.

The Tableau visualization can be found here.

[1] From January 25th, 2023, to February 6th 2023

Analysis

The users have randomly been split into two groups, independently from the other users.



The sample size is large enough to conclude that the distribution is normally distributed.
All the calculations assume α of 0.05.

The statistical calculations have been divided into three groups:

Calculations on the difference of the conversion rate between the two groups

The purpose of these calculations is to check if there's a significance difference of users with and without the banner.

According to the results, in a confidence level of 95%, there is a difference in the conversion rate: conversion rate A (3.92%) → B (4.63%).

According to the statistical Z test, there is a significance difference between the conversion rates.

The bounds of confidence are [0.35% - 1.07%]. The intervals do not include the null value $\mu_0=0$ which lead us to reject the null hypothesis.

Figure 1 - Confidence Levels for Conversion Rate

As seen in Figure 1 – the bounds of confidence for both 95% and 99% confidence level do not include the null value.

So, we can conclude that the banner had a significant effect on the conversion rate.

Calculations on the difference of the money spent per user between the two groups

After we concluded that the conversion rate had indeed increased due to the banner, we proceed to check if the increased rate is translated into higher sales. The average spending per user for group A ($3.37) is very close to group B ($3.39) and the difference is not significant.

The bounds of confidence are [-$0.43 - $0.47]. The margin includes the null value μ_0=0 which lead us to fail to reject the null hypothesis.

Figure 2 - Confidence Levels for Average Spending ($)

As seen in Figure 2 the bounds of confidence for both 95% and 99% confidence level do not include the null value.

So, we can conclude that the banner had no significant effect on the average amount spent between the two groups.

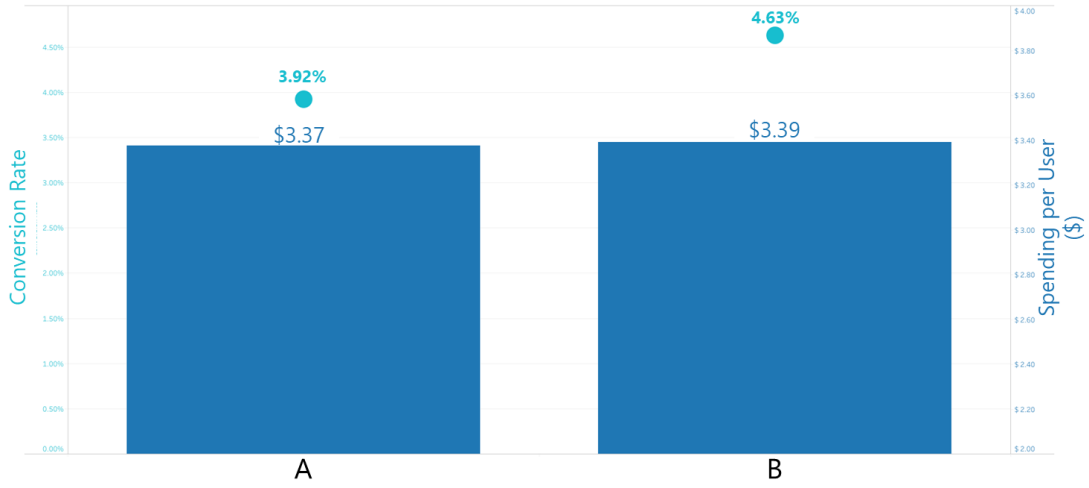
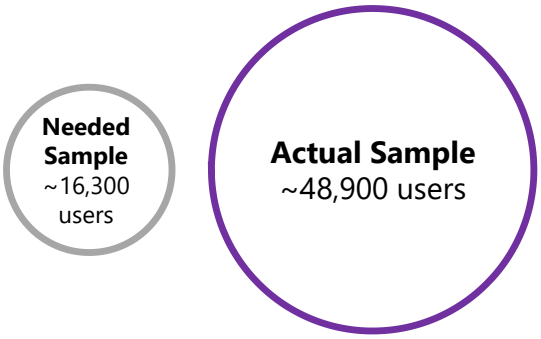


Figure 3 - Key Measurments

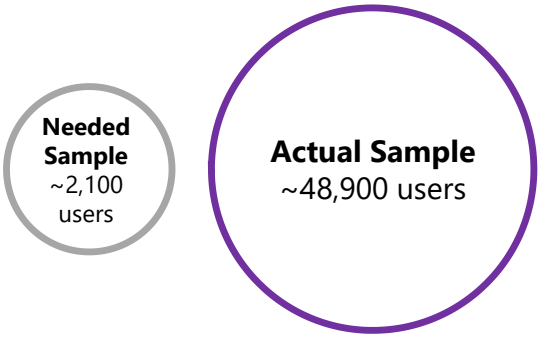
As seen in Figure 3 – the conversion rate difference is far more distinct than the spending average.

Power analysis

These calculations are intended to confirm that the sample size of our test is big enough for the desired minimum detectable effect and statistical power.
The first inspection is to see whether the sample size is big enough for the detectable effect we found on the difference in the conversion rate[2]:



For this analysis we would need a sample of at least 16,300. Each group is bigger than that number so the conclusion is that the sample size is more than enough for a powerful analysis.
In addition, another test had been done for the compering of the spending[3].



In our experiment the sample size is sufficient.

[2] Based on the analysis of statsig.com | 49.7% split ratio, baseline conversion 3.92%, $\alpha = 0.05$
[3] Based on the analysis of statulator.com | observed mean difference 0.02, std. error 0.23

Further Analysis

After the initial analysis, I have conducted four more inspections, utilizing the different data points, to search for more possible trends in the data.

Analysis by cellphone operating system

This analysis is set to check whether there is a different outcome when subdividing the users by their respective device operating system.

The results, as can be seen in Figure 4 are that there is no significant difference in the statistics. Both sub-divisions have shown increase of conversion rate, but the slight increase in average spending of Android users is offset by the slight decrease of iOS users.

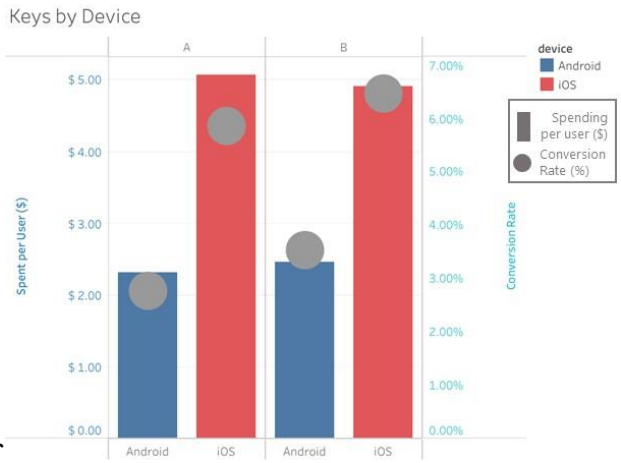


Figure 4 - Key Parameters by Device

Analysis by gender

This analysis is set to check whether there is a different outcome when subdividing the users by their respective gender. In the data there are several options – besides male and female, there are other and unknown.

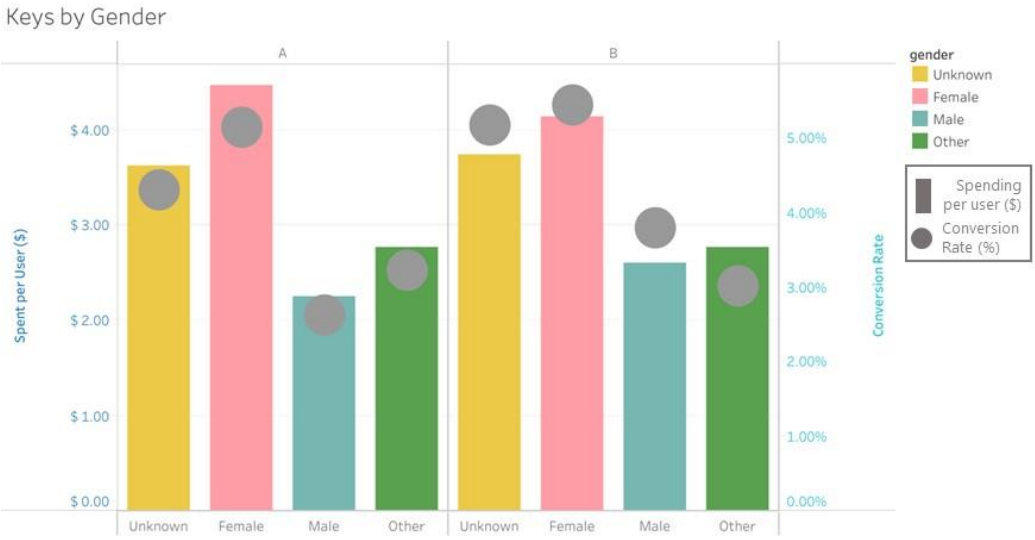


Figure 5 - Key Parameters by Gender

The calculation, as can be seen in Figure 5 shows mixed results. The conversion rate of all genders, besides other has increased. However, the average spending of both female and other decreased when shown the banner. This effect is offset by the slightly larger increase of the spending of males.

Global analysis

This analysis is set to check whether there is a different outcome when subdividing the users by their country.

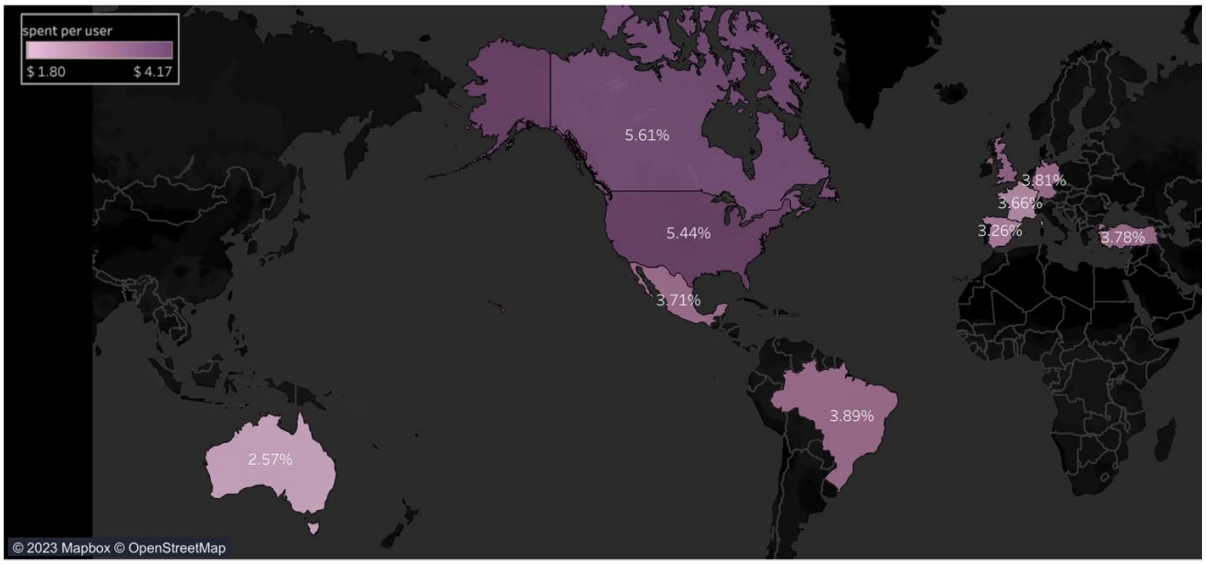


Figure 6 - Key Parameters by Country

The most valuable market in both keys is the North American market, where both US and Canada shown relatively higher rates on both parameters. For additional information, see appendix c.

Novelty Effect

As mentioned, the experiment took place for 12 days. It is important to investigate the key parameters' behavior as the experiment progresses, to see if the appearance of the banner had a long-term effect.

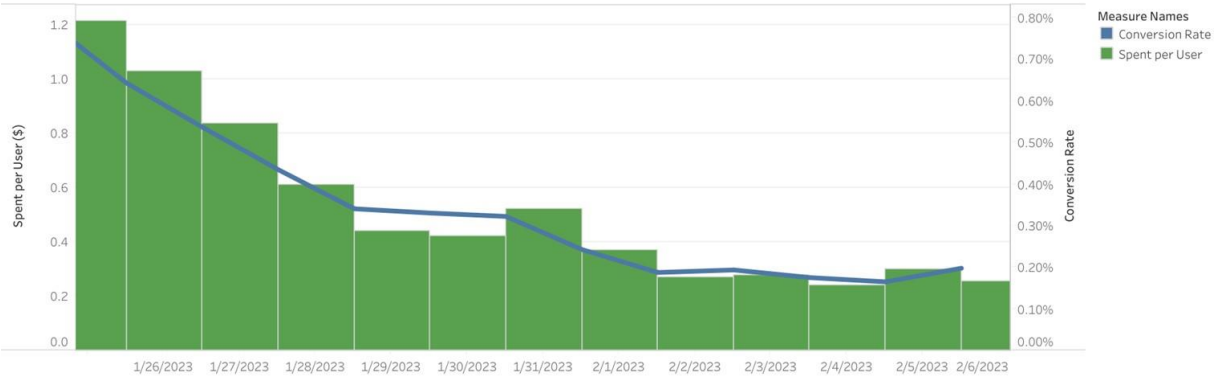


Figure 7 - - Key Parameters Over Time

As we can easily see from Figure 7, there is a very prominent novelty effect, as the parameters dive after 4 days from the start of the experiment. This means that most of the purchases has been done only a few days after the appearance of the banner but did not last.

Conclusions and Recommendations

Based on the comprehensive analysis, I strongly recommend that we reassess our expansion into the food and drinks sector. The banner has proven effective in increasing the conversion rate and driving sales. However, the lack of significant change in the average spending per user suggests that food and drink prices might be comparatively lower than other products, potentially impacting profitability. Additionally, the novelty effect indicates that users are not becoming returning customers, questioning the long-term appeal of this sector to our user base.

Key Recommendations:

- Reevaluate the expansion into the food and drinks sector due to mixed results in revenue and user engagement.
- Conduct further analysis to determine if increased conversion rates in this sector lead to higher sales in other departments.

- Optimize the use of banners to boost user awareness and interest in our offerings.
- Prioritize other profitable avenues for growth while maintaining a cautious approach to the food and drinks sector.
- Focus on strategies to enhance user retention and loyalty in all sectors to drive sustainable business growth.

Appendix a: the new banner

Group A: Control
existing landing page

Group B: Treatment
landing page with food & drink banner

Appendix b: SQL queries

The queries have been performed on the GloBox dataset (link) on MySQL engine.

The schema is called masterschool.

1) **Dataset:**

```
SELECT g.uid AS user_id
     ,g.GROUP AS user_group
     ,g.device
     ,u.gender
     ,u.country
     ,CASE
          WHEN a.dt >= g.join_dt
               THEN 1
          ELSE 0
          END AS converted
     ,sum(a.spent) AS spent
FROM masterschool.groups g
LEFT JOIN users u ON g.uid = u.id
LEFT JOIN activity a ON g.uid = a.uid
GROUP BY 1 ,2 ,3 ,4 ,5 ,6;
```

2) **Dataset with dates:**

```
SELECT g.uid AS user_id
     ,g.GROUP AS user_group
     ,g.device
     ,u.gender
     ,u.country
     ,a.dt AS activity_date,
     ,CASE
          WHEN a.dt >= g.join_dt
               THEN 1
          ELSE 0
          END AS converted
     ,sum(a.spent) AS spent
FROM masterschool.groups g
LEFT JOIN users u ON g.uid = u.id
LEFT JOIN activity a ON g.uid = a.uid
GROUP BY 1 ,2 ,3 ,4 ,5 ,6, 7;
```

Appendix c: metrics per country

Country	A		B	
	Conversion Rate	Avg. Spent/User	Conversion Rate	Avg. Spent/User
AUS	2.14%	$1.67	3.04%	$2.08
BRA	3.73%	$3.21	4.06%	$3.06
CAN	4.69%	$3.59	6.48%	$4.20
DEU	3.20%	$3.39	4.42%	$2.69
ESP	2.91%	$2.18	3.61%	$3.21
FRA	3.13%	$2.67	4.18%	$2.26
GBR	2.89%	$2.11	3.68%	$4.48
MEX	2.95%	$2.81	4.45%	$3.33
TUR	4.00%	$3.68	3.56%	$2.48
USA	5.12%	$4.28	5.75%	$4.04

Table1 - Key Parameters by Country