**Project Title:**

**“Evaluation of A/B Testing of the Control and Conversion Group of the Mobile Homepage of the Food and Drink Product Category of Glo Box Online Company.”**

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**Project Summary**

The project was designed with a clear objective: to assess the impact of a new banner feature (Group B) in comparison to the existing setup (Group A) on key metrics, specifically focusing on the conversion rate and average user spending. This meticulous evaluation sought to uncover insights that would guide decision-making and optimization efforts for the company's digital platform.

Through a methodical process of data collection, analysis, and interpretation, the project delved into the behaviour of users exposed to the new banner feature and those who encountered the standard setup. This comparative analysis aimed to unearth any discernible differences in user engagement, conversion patterns, and spending behaviours between the two groups.

The findings of the project have been meticulously compiled, offering a comprehensive view of the performance metrics observed during the testing phase. From examining conversion rates to dissecting average user spending, the project has provided valuable insights into how the new banner feature influenced user interactions and ultimately impacted the desired outcomes.

Considering the data-driven analysis, clear recommendations have emerged, offering actionable insights for the company's digital strategy moving forward. These recommendations are informed by a thorough understanding of the observed trends, patterns, and behaviours exhibited by users in both Group A and Group B.

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**1.0. Introduction.**

GloBox stands as a premier e-commerce destination, celebrated for its distinctive curation of unique, high-quality products sourced from diverse corners of the globe. Rooted in a philosophy that seeks to elevate shopping into an exhilarating adventure, the company is committed to making the global market easily accessible to consumers, all with the convenience of a few taps on their mobile phones.

**1.1. Problem statement.**

GloBox, a distinguished name in boutique fashion and upscale decor, has experienced notable expansion in its food and drink offerings, marking a new chapter in its product portfolio. To amplify awareness and drive revenue for this burgeoning category, the company's growth team has put forth an innovative proposal: an A/B test designed to gauge the impact of showcasing select products from the food and drink category as a prominent banner at the top of the website.

The essence of this test lies in its simplicity yet potential effectiveness: the control group, representing the status quo, will not be exposed to the banner. In contrast, the treatment group will encounter the banner upon visiting the website, strategically positioned to catch their attention and pique interest in the delectable offerings of the food and drink category.

This A/B test serves as a strategic manoeuvre to evaluate the banner's influence on user engagement, conversion rates, and ultimately, revenue generation. By analysing the behaviour and interactions of both groups, the firm aims to glean valuable insights into the effectiveness of the banner in driving user interest and encouraging exploration of the food and drink collection.

The hypothesis underpinning this test is straightforward yet impactful: by prominently featuring the food and drink category through a visually appealing banner, the organisation anticipates an uptick in user engagement, leading to increased conversions and revenue within this segment.

Through meticulous analysis of metrics such as click-through rates, time spent on the food and drink category pages, and ultimately, conversion rates, GloBox aims to make data-informed decisions regarding the banner's efficacy. This data-driven approach ensures that the company can optimize its marketing strategies, refine the customer experience, and capitalize on the growing interest in its food and drink offerings.

In essence, the A/B test proposed by company embodies a strategic initiative to leverage its digital presence and user interface to drive growth in a new and expanding category. By harnessing the power of experimentation and data analytics, the company seeks to unlock the untapped potential of its food and drink collection, delighting customers and bolstering its position as a versatile lifestyle brand.

**1.2. A/B Test Setup**

The setup of the A/B test is as follows:

1. The experiment is only being run on the mobile website.
2. A user visits the GloBox main page and is randomly assigned to either the control or test group.
3. The page loads the banner if the user is assigned to the test group and does not load the banner if the user is assigned to the control group.
4. The user subsequently may or may not purchase products from the website. It could be on the same day they join the experiment or days later. However, if they do make one or more purchases, this is considered a “conversion”.
5. The project has a completion date of one month from the start date.

**1.3. Objective and motivation of the use A/B test for the project.**

A/B testing, also recognized as split testing, stands as a powerful method employed by businesses to meticulously compare two or more versions of a webpage or advertisement. The primary aim behind the company's decision to utilize A/B testing for the launch of a website page on mobile phones is to craft a mobile-optimized user experience that not only garners higher conversion rates but also elevates the overall performance of the website.

The motivation fuelling this testing endeavour lies in the desire to leverage data-driven insights for making informed decisions regarding design and content. By subjecting different versions of the mobile website page to the A/B test, the company seeks to uncover which elements, layouts, or content configurations resonate most effectively with users. This approach empowers the company to discern what aspects of the mobile user experience led to increased engagement, conversions, and user satisfaction.

Through meticulous analysis of user interactions, click-through rates, bounce rates, and ultimately, conversion rates, the A/B test serves as a compass guiding the company towards an optimized mobile website. The data collected from the test provides invaluable insights into user preferences, behaviours, and pain points, enabling the company to tailor the mobile experience to meet the specific needs and expectations of its target audience.

Furthermore, the company recognizes that in today's digital landscape, a seamless and user-friendly mobile experience is paramount. With the prevalence of smartphones and the growing trend of mobile browsing and shopping, ensuring a mobile-optimized website is no longer an option but a necessity.

By embarking on the A/B testing journey, the company aims to:

1. Enhance User Experience: By analysing user interactions with different versions of the mobile website page, the company can identify design elements, navigation paths, and content formats that offer the most intuitive and enjoyable user experience.
2. Increase Conversion Rates: The goal of the A/B test is to pinpoint the version of the mobile website page that drives the highest conversion rates. This may involve testing different call-to-action buttons, product placements, or checkout processes to optimize the path to conversion.
3. Drive Engagement: Engaging mobile users is crucial for building brand loyalty and repeat business. Through A/B testing, the company can identify features or content that captivate users' attention and encourage them to explore further.
4. Optimize for Mobile Search: With mobile friendliness being a key factor in search engine rankings, a well-optimized mobile website not only improves user experience but also boosts visibility in search results.

**2.0. Extraction of the Datasets**

The experiment utilized datasets comprising 48,943 records extracted from Beekeeper Studio's relational database using SQL. Customers were randomly assigned to control or treatment groups, and data from the company's database was utilized. Beekeeper Studio, an open-source SQL editor, facilitated easy data extraction. Control and treatment group sample sizes (24,343 and 24,600, respectively) were obtained through SQL.

Additional variables, such as user conversion rates and average spending, were extracted from Beekeeper Studio. After database extraction, datasets were saved in CSV format for statistical analysis in a spreadsheet and Tableau. Test metrics were applied, and visualizations were created to produce a performance-oriented dashboard on Tableau. The objective was to enhance understanding and facilitate a comprehensive overview of the study.

**3.0. Analysis of the A/B test results using statistical methods**

3.1. A hypothesis test to see whether there is a difference in the conversion rate between the two groups.

The hypotheses are defined as below:

* The null hypothesis (H0): There is no significant difference in the conversion rates between the control and treatment group:
* The alternative hypothesis (Ha): There is a significant difference in the conversion rates between the control and treatment groups:

The significance level (α) for the test is set as 0.05, which corresponds to a 5% significance level. The test is conducted for a difference in proportions as a two-sample z-test with pooled proportion with formular below:

z= P1-P2/sqrt(P(1-p) (1/n1 + 1/n2))

Where:

P1​ and P2 are the sample proportions of conversions in the control and treatment groups, respectively.

N1​ and N2 are the sample sizes of the treatment and control groups.

p^ is the overall pooled sample proportion. Which is calculated as:

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P1 =4.63, P2=3.92, N1=24600, N2=24343, P=4.28

z= PT-PC/sqrt(P(1-P) (1/NT + 1/NC))

4.63-3.92/sqrt (4.28(1-4.28) (1/24600 + 1/24343))

0.71/sqrt (-14.04) (8.172)

0.71/sqrt (-114.73)

0.71/-10.71

z = -0.06

The p-value for a z-score of -0.06 at a 5% significance level (95% confidence level) is greater than 0.05. In other words, the observed z-score of -0.06 is not extreme enough to be considered statistically significant at the 0.05 significance level.

Take a decision:

Compare the p-value to the significance level (α).

* If p-value < α, at 5%, reject the null hypothesis.
* If p-value ≥ α, at 5%, fail to reject the null hypothesis.

Conclusion:

Since the p-value is greater than 0.05, we fail to reject the null hypothesis, which indicates that there is not enough evidence to reject the null hypothesis. In other words, we do not have strong statistical evidence to conclude that there is a significant difference between the two groups.

**3.2. The confidence interval for a difference in proportion is calculated using Two-sample z- interval with unpooled proportions with the formular below:**

CI= (PT-PC) ± Z (sqrt (pt (1-PT)/NT + PC (1-PC)/NC)

Where:

The conversion rate in the treatment group (PT) = 4.63%

The conversion rate in the control group (PC)= 3.92%

The sample size of the treatment group (NT)= 24600

The sample size of the control group (NC) =24343

Z is the critical value from the standard normal distribution corresponding to a 95% confidence level. For a 95% confidence level, Z =1.96

Sample statistics = (4.63-3.92) = 0.71%

Critical value (Z), for a 95% confidence level is set at: 1.96.

Standard Error = sqrt ((4.63(1-4.63)/24600) + 3.92(1-3.92)/24343)) =0.0339.

Margin of Error = critical value \*standard error

Margin of Error= 1.96 \* 0.0339 = 0.0664

Substituting the formular:

4.63-3.92 ± 1.96 \*sqrt ((4.63(1-4.63)/24600 + 3.92(1-3.92)/24343))

0.71 ± 1.96 \* sqrt ((-16.8069/24600) + (-11.4464/24343))

0.71 ± 1.96 \* sqrt (-0.0006832) + (-0.00047)

0.71 ± 1.96 \* sqrt (0.00115) =0.0339

0.71 ± (1.96 \* 0.0339)

0.71 ± 0.0664

CI = 0.71 ± 0.0664

CI=0.7764 (Upper limit) and 0.6436 (Lower limit)

Conclusion: We conclude that with 95% confidence, we estimate that the true difference in the parameter (conversion rates) between the two groups lies somewhere between 0.6436 and 0.7764.

**3.3. A hypothesis test to see whether there is a difference in the average amount spent per user between the two groups.**

Define the Hypotheses:

* Null Hypothesis (*H*0​): There is no significant difference in the average amount spent per user between the two groups.
* Alternative Hypothesis (*Ha*​): There is significant difference in the average amount spent per user between the two groups.

The significance level (α) for the test is set at 0.05, which corresponds to a 5% significance level. The test is conducted as a two-sample t-test for the difference in means with unpooled variance with the formular below:

T = 



Where:

X1 as XT= 3.391 is the sample means of the amount spent in the treatment group

X2 as XC = 3.375 is the sample means of the amount spent in the control group

S1 as ST= 100.24 is sample standard deviations of the amount spent in the treatment group

S2 as SC= 100.24 is sample standard deviations of the amount spent in the control group

n1 as nc=24600 is the sample size of the treatment group

n2 as nc=24343 is the sample size of the control group

Substitute the formular:

T = 3.391 – 3.375 /sqrt ((94.03\*94.03)/24600) + (100.24\*100.24)/24343))

0.016/ sqrt ((8470/24600) +( 10048/24343))

0.016 / sqrt (0.3443+0.4127)

0.016 / sqrt (0.757)

0.016/0.87

T = 0.02

Degrees of Freedom:

Using the formular for DF: min (n1-1, n2-1)

DF = (24600-1) =24599

(24343-1) =24342

The minimum value is = 24342.

Level of significance:

The level of significance is estimated at 5%, for a 95% confidence level and degree of

freedom.

Calculate the P-Value:

Given the t-score of 0.02 and DF as 24342, a t-distribution online calculator was used for a two-tailed sample with a significance level of 5% which resulted to a p-value of 0.98.

p-value > 0.05

0.98 >0.05.

Take a decision:

* If the p-value is <than the chosen level of significance of 0.05, we reject the null hypothesis.
* If the p-value is > than or equal to the chosen level of significance of 0.05, we fail to reject the null hypothesis.

Conclusion:

Since the p-value is greater than 0.05, we fail to reject the null hypothesis. This suggest there is not enough evidence to conclude that there is a significant difference in the average amount spent per user between the groups. This also indicates a high probability that the observed result could occur by random chance.

**3.4. The confidence interval for a difference in Means is calculated using Two-sample t- interval with unpooled variance with the formular below:**

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* X1​ is the sample mean of the treatment group (average amount spent).
* X2​ is the sample mean of the control group (average amount spent).
* S1​ is the sample standard deviation of the treatment group.
* S2​ is the sample standard deviation of the control group.
* n1​ is the sample size of the treatment group.
* n2​ is the sample size of the control group.
* α/2​ is the significance level 0f 5% divided by 2 to account for the two tails for a 95% confidence interval.
* Df is the degrees of freedom for the distribution, which can be calculated using the formular for unequal variances:

CI= (3.391 – 3.375) ± *tα*/2​,df sqrt (94.03\*94.03)/24600) + (100.24\*100.24)/24343)

CI = 0.016 ± 1.96 sqrt (94.03\*94.03)/24600) + (100.24\*100.24)/24343

CI =0.016 ± 1.96 sqrt (8842/24600) + (10048/24343)

Sqrt (0.3594 +0.4128) = 0. 8787

CI =0.016 ± 1.9600 (0.8787)

CI = 0.016± 1.72

CI = -1.704(lower limit) and 1.736 (upper limit).

Conclusion:

In view of the result, we are 95% confident that the true difference in the average amount spent per user between the treatment and control groups falls between -1.704 and 1.736.

NOTE:

Critical value =*t* (α​/2, *df*)

t (0.05/2, 24342) = (0.025,24342)

However, due to the volume of the datasets, the df of 24342 cannot be accessed on the t-table and on the online calculator, hence a two-tailed 95% confidence interval was used at ±1.96 for a 95% confidence level.

Sample Statistics = Average amount spent (X1) - Average amount spent (X2)

3.391 – 3.375 = 0.016

Standard Error Formula:

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SE = Sqrt (0.3594 +0.4128) = 0.88

**4.0. Data Visualization/Chart.**

The study harnessed the formidable capabilities of Tableau to translate the results of the datasets into a dynamic and performance-driven dashboard. This choice was made due to Tableau's reputation for its robust data visualization features, enabling the creation of interactive and insightful visualizations that go beyond mere data representation.

With Tableau, the researchers were able to delve deep into the intricacies of the test results, identifying trends, patterns, and correlations within the data. The application's user-friendly interface and intuitive design tools allowed for the creation of visualizations that not only present data but also tell a compelling story, making it easier for stakeholders to grasp complex information.

One of the key advantages of using Tableau is its flexibility in connecting to a variety of data sources. Whether it's databases, spreadsheets, or other data repositories, Tableau seamlessly integrates the collected data, streamlining the analysis process. This flexibility not only saves time but also ensures that the analysis is comprehensive and inclusive of all relevant data points.

In the context of the test, five distinct visualizations and a comprehensive dashboard were crafted using Tableau. Each visualization served a specific purpose, ranging from trend analysis to comparison charts, allowing for a multi-faceted examination of the test results. These visualizations provided a clear and concise representation of the data, enabling the researchers to:

1. **Identify Trends and Patterns**: Through line charts and trend analysis, the researchers could pinpoint trends in user behaviour, sales performance, or any other key metrics under investigation.
2. **Compare Results**: Bar charts and scatter plots were utilized to compare different variables, such as A/B test variations, customer segments, or product categories, shedding light on performance differentials.
3. **Track Progress**: Progression charts and gauges were employed to track the evolution of key metrics over time, providing insights into the effectiveness of implemented strategies or interventions.
4. **Understand User Behaviour**: Heat maps and geographic visualizations offered a geographical perspective, highlighting regional variations in user engagement, sales distribution, or market penetration.
5. **Summarize Insights**: The comprehensive dashboard brought together these visualizations into a single, cohesive interface. This allowed stakeholders to view the test results holistically, gaining a complete understanding of the findings briefly.

By leveraging the power of Tableau, the study not only analysed the test results but also transformed them into actionable insights. The interactive nature of the visualizations enabled stakeholders to explore the data, drill down into specific details, and derive meaningful conclusions. This not only facilitated data-driven decision-making but also enhanced communication of findings to stakeholders across the organization.

**4.1. Conversion rate and average amount spent between the test groups.**

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Description automatically generated with medium confidence

Fig. 4.1. Own Source: Tableau.

Figure 4.1 presents a compelling bar chart that meticulously compares the conversion rates and average spending between two distinct groups: the treatment group and the control group. This visual representation of the data unveils intriguing insights into the behavioural patterns of the groups, shedding light on their responses to the test conditions.

Upon close examination of the chart, it is discernible that the treatment group exhibited an average spending of $3.391 per user. In contrast, the control group displayed a slightly lower average spending of $3.375 per user, resulting in a minimal $0.01 difference between the two groups. This subtle variance in average spending hints at nuanced shifts in user behaviour influenced by the test conditions.

Delving further into the comparison, the chart reveals another critical metric: the user conversion rates for each group. The treatment group boasts a notable user conversion rate of 4.63%, signifying the percentage of users who completed a desired action, such as making a purchase. In contrast, the control group's user conversion rate stands at 3.92%, indicating a difference of 0.71% between the two groups.

These findings are pivotal as they underscore the effectiveness of the test conditions in driving user engagement and conversion. The higher conversion rate of the treatment group suggests that the implemented changes or interventions positively influenced user behaviour, leading to a higher percentage of successful conversions.

Moreover, while the difference in average spending between the groups may appear marginal at first glance, it still holds significance. Even a slight increase in average spending, as seen in the treatment group, can translate into substantial revenue gains when applied to a larger user base.

Overall, Figure 4.1's bar chart serves as a powerful visual tool for comprehending the test results briefly. It vividly illustrates the nuanced differences in average spending and conversion rates between the treatment and control groups, providing valuable insights into the impact of the test conditions on user behaviour.

These insights are not only instrumental in evaluating the success of the test but also in informing future strategies and decision-making processes. By leveraging the data presented in Figure 4.1, stakeholders can refine marketing strategies, optimize user experiences, and drive business growth based on evidence-backed insights.

**4.2. Distribution of the amount spent per user for each group.**

A graph of different colored lines

Description automatically generated

Fig. 4.2. Own Source: Tableau.

Figure 4.2 unveils a detailed view of the distribution of amount spent for two distinct groups, Group A and Group B, through the lens of boxplots. These visual representations offer nuanced insights into the spending patterns of the groups, shedding light on key statistical measures that illuminate their behaviour.

A notable observation from the boxplots is the similarity in the median spending levels between Group A and Group B. Both groups exhibit median spending values of $64 in Group A and $52 in Group B, indicating a central tendency in the amount spent by users in each group. This suggests that, on average, users in both groups are spending a comparable amount.

However, a crucial distinction emerges when examining the interquartile range (IQR) of the two groups. Group A displays a wider IQR compared to Group B, indicating a greater variability in spending among users in Group A. This variability could suggest diverse spending habits or preferences among users in Group A, contributing to the broader range of spending amounts.

Another noteworthy aspect highlighted by the boxplots is the presence of outliers in both groups. Outliers represent data points that significantly deviate from the typical pattern of the dataset and can potentially skew the results. In this case, the presence of outliers in both Group A and Group B raises the possibility of distortion in the distribution results, warranting further investigation into the factors influencing these outlier values.

Moreover, the impact of 117 filtered null values on the visualizations for both groups cannot be overlooked. Null values, if not properly handled, can affect the accuracy and reliability of the analysis. Understanding the presence of these null values is crucial in interpreting the visualizations and ensuring the integrity of the data analysis process.

In conclusion, Figure 4.2's boxplots offer a comprehensive view of the distribution of amount spent for Group A and Group B, unveiling both similarities and distinctions in their spending patterns. While both groups exhibit similar median spending levels, the wider IQR in Group A suggests greater variability in spending habits among users. The presence of outliers in both groups and the impact of filtered null values underscore the importance of careful data preprocessing and interpretation in drawing meaningful conclusions from the visualizations.

These insights not only provide a deeper understanding of the spending behaviour of the groups but also serve as a foundation for further analysis and decision-making. By acknowledging the nuances revealed in Figure 4.2, stakeholders can tailor marketing strategies, optimize user experiences, and drive business growth based on a nuanced understanding of user spending patterns and behaviours.

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**4.3. Relationship between the test metrics (conversion rate and average amount spent) and the user’s device.**

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Description automatically generated with medium confidence

Fig. 4.3. Own Source: Tableau.

Figure 4.3 unveils a compelling horizontal bar chart that offers a concise yet impactful comparison of the datasets for Group A and Group B. This visual representation provides a clear snapshot of the spending patterns associated with different devices in each group, shedding light on key insights that inform user behaviour and preferences.

A striking observation from the chart is the highest average total spending associated with specific devices in each group. In Group A, users exhibit the highest average total spending of $75.71, notably linked with the usage of iPhones. This finding suggests a strong correlation between iPhone usage and higher spending levels among users in Group A. This insight could be indicative of the premium nature of iPhones, attracting users who are willing to spend more on their purchases.

Similarly, in Group B, the chart reveals that users display the highest average total spending of $68.22, also prominently tied to the usage of iPhones. This consistent trend across both groups underscores the significance of iPhone usage in influencing spending behaviour among users. It indicates a consistent pattern where users who utilize iPhones tend to exhibit higher average total spending compared to users of other devices.

By presenting this information in a horizontal bar chart format, Figure 4.3 enables a straightforward comparison between the spending patterns of Group A and Group B. The chart's visual clarity allows stakeholders to quickly discern the devices that drive the highest average total spending in each group, facilitating informed decision-making and targeted strategies.

Moreover, the concise nature of the horizontal bar chart ensures that the key insights are communicated effectively to stakeholders. This includes marketing teams looking to tailor campaigns, product developers seeking to optimize offerings, and decision-makers aiming to understand user preferences.

In conclusion, Figure 4.3 serves as a powerful visual tool that succinctly highlights the spending patterns associated with different devices in both Group A and Group B. The chart's emphasis on the highest average total spending linked to iPhone usage in both groups underscores the influence of device choice on user behaviour.

These insights offer valuable guidance for stakeholders, enabling them to refine marketing strategies, enhance user experiences, and drive business growth based on a nuanced understanding of user preferences and spending habits across different devices. Ultimately, Figure 4.3 provides a clear and impactful overview of the datasets, empowering stakeholders with actionable insights derived from the analysis of user spending patterns.

**4.4. Relationship between the test metrics (conversion rate and average amount spent) and the user’s gender.**

A graph with numbers and lines

Description automatically generated with medium confidence

Fig. 4.4. Own Source: Tableau.

Figure 4.4 introduces a visually captivating horizontal bar chart that brings to light crucial data variables, providing a succinct yet impactful overview of spending patterns based on gender within Group A. This visual representation offers a nuanced glimpse into the average total spending behaviours of females and males within the group, shedding light on gender-specific trends in consumer behaviour.

A standout observation from the chart is the revelation of the highest average total spending recorded within Group A, particularly among females. The data vividly showcases that female within Group A exhibited an impressive average total spending of $76.75. This figure suggests a distinct inclination towards higher spending habits among female users within the group. This insight could indicate preferences for premium products, a higher propensity to make larger purchases, or a stronger inclination towards certain product categories.

In contrast, the chart also highlights the average total spending of males within Group A, standing at $72.82. Though slightly lower than the average spending observed among females in the same group, this figure signifies a substantial spending capacity among male users. This insight into the spending behaviour of males within Group A hints at a robust consumer base with a notable willingness to invest in their purchases.

The choice of a horizontal bar chart as the visualization tool proves effective in conveying these spending patterns based on gender within Group A. Its clear layout and visual appeal enable stakeholders to swiftly grasp the key insights, facilitating informed decision-making and strategic planning.

Furthermore, the chart's concise and focused presentation ensures that the emphasis is on the highest average total spending recorded among females in Group A. This revelation can serve as a pivotal guide for marketing teams, product developers, and decision-makers, offering a deeper understanding of the nuanced differences in gender-specific consumer behaviours.

In conclusion, Figure 4.4 stands as a robust visual aid that illuminates the spending dynamics based on gender within Group A. The chart's emphasis on the highest average total spending among females within the group underscores the significance of gender-specific insights in crafting tailored business strategies.

These insights empower stakeholders to fine-tune marketing campaigns, curate products to suit gender-specific preferences, and enhance overall user experiences. Ultimately, Figure 4.4 encapsulates a clear and compelling depiction of the datasets, delivering invaluable insights derived from the analysis of spending patterns among female and male users within Group A.

**4.5. Relationship between the test metrics (conversion rate and average amount spent) and the user’s country.**

A graph of numbers and a number of numbers

Description automatically generated with medium confidence

Fig. 4.5. Own Source: Tableau.

Figure 4.5 unfolds as a visually impactful horizontal column chart, effectively highlighting a pivotal data variable. This concise yet impactful visualization offers a clear overview of the highest average total sum spent within Group A and Group B across different regions, shedding light on notable trends in consumer spending behaviour.

A significant highlight from the chart is the revelation of the highest average total sum spent in Group A, particularly in Germany (DEU), with an impressive amount of $95.32. This figure underscores a distinct propensity for higher spending levels among users within Group A, particularly those in Germany. This insight could signify various factors such as economic conditions, consumer preferences, or the popularity of certain products within the German market.

In contrast, the chart also illuminates the highest average amount spent in Group B, observed in the United Kingdom (GBR) at $95.27. This finding indicates a similar trend of robust spending among users in Group B, particularly those located in the UK. This insight suggests a strong purchasing power and consumer demand within the UK market, driving higher average spending levels among users in Group B.

The choice of a horizontal column chart as the visualization tool proves effective in conveying the range of spending observed across different groups and regions. The chart's clear layout and visual appeal enable stakeholders to swiftly discern the key insights, facilitating informed decision-making and strategic planning.

Furthermore, the chart succinctly communicates the variations in average total sum spent, with the lowest amounts being $53.79 in Group B and $64.52 in Group A. This comprehensive overview of spending patterns across different regions offers valuable insights into the diverse consumer behaviours within each group.

In conclusion, Figure 4.5 serves as a robust visual representation that illuminates the range of average total sum spent within Group A and Group B across various regions. The chart's emphasis on the highest average total sum spent in Germany (DEU) for Group A and the United Kingdom (GBR) for Group B underscores the significance of regional influences on consumer spending.

These insights empower stakeholders to tailor marketing strategies, optimize product offerings, and enhance user experiences based on a nuanced understanding of regional spending patterns. Ultimately, Figure 4.5 encapsulates a clear and impactful depiction of the datasets, delivering invaluable insights derived from the analysis of spending patterns across different regions within Group A and Group B.

**5.0. GloBox Dashboard System**

Below is the dashboard visualization of the variables, providing a comprehensive overview of key metrics and trends. The dashboard system enhances accessibility and allows for a more interactive exploration of the experiment results.

**A screenshot of a computer

Description automatically generated**

Fig. 5.0. Dataville marketing company dashboard system

**6.0. Findings**

The statistical test results are presented below:

1.Conversion Rate: The results of our hypothesis testing indicate that there is not enough evidence to conclude a significant difference in the conversion rate between Group A and Group B. This suggests that the observed variations in conversion rates could likely occur by random chance.

2.Average Amount Spent: Similarly, our analysis did not reveal a statistically significant difference in the average amount spent per user between the two groups. The observed differences in spending may also be attributed to random chance.

3.Visualization Results: The visualization of the test metrics showed that Group A exhibited higher values compared to Group B in various aspects. This further supports the notion that the observed results could be a result of random variation.

**7.0. Recommendations**

Based on the comprehensive analysis and insights derived from the A/B test, our recommendation leans against the immediate launch of the new banner feature. The results of our analysis did not exhibit a substantial enhancement in our key success metrics, indicating that the feature may not deliver the desired impact at this stage.

Our thorough examination of the data suggests that the perceived benefits of launching the feature do not outweigh the associated costs. The lack of significant improvements in conversion rates and average spending raises concerns about the effectiveness and potential ROI of the feature.

Considering these findings, it appears prudent to exercise caution and refrain from releasing the feature to all users currently. Instead, we propose further refinement and reconsideration of the feature before proceeding with a full-scale launch. This approach will allow us to address any potential shortcomings, optimize the feature for maximum impact, and ensure a more successful rollout in the future.

Additionally, we recommend revisiting the initial objectives and goals of the feature to ensure alignment with user needs and preferences. Conducting additional user research, gathering feedback, and exploring alternative design iterations can provide valuable insights into how we can enhance the feature to better serve our users.

Ultimately, our decision is guided by a strategic cost-benefit analysis, aiming to maximize the value proposition for both the users and the company. By taking a deliberate and data-driven approach to feature development, we can ensure a more successful and impactful launch when the time is right.

In summary, based on the findings and insights from the A/B test, we advise against the immediate launch of the new banner feature. Further refinement, iteration, and consideration are warranted to optimize the feature for enhanced user engagement and success.

**8.0. Limitation of the Experiment**

While visualizing the data, the presence of outliers in both Group A and Group B poses a risk of distorting and biasing the distribution results. Furthermore, the decision to filter out and ignore nulls in the datasets could potentially impact our analysis negatively. This approach not only introduces changes but also raises concerns about data loss and the potential for bias in our findings. Acknowledging and addressing these limitations is crucial for a comprehensive understanding of the experiment results.

**9.0. Conclusion**

In conclusion, the findings from the A/B testing experiment have provided valuable insights into user behaviour and preferences, yet the data does not currently support the implementation of the new banner feature. While the experiment offered important information, further refinement is needed to achieve the desired outcomes effectively.

The results indicate that the new banner feature did not lead to a significant increase in user engagement or conversion rates compared to the control group. This suggests that the current design or placement of the banner may not resonate effectively with users, or there may be other factors at play that are influencing user behaviour.

Therefore, we recommend revisiting the design and functionality of the banner feature. This could involve conducting additional tests with variations in design elements, placement, or messaging to identify what resonates best with users. A more thorough exploration of alternative strategies and iterations will allow us to pinpoint the most effective approach for achieving our objectives.

**10.0. References**

Control group (Group A)

SELECT \*

FROM users as u

JOIN groups as a

ON u.id = a.uid

WHERE a.group = 'A';

Treatment group (Group B)

SELECT \*

FROM users as u

JOIN groups as b

ON u.id = b.uid

WHERE b.group = 'B';

User conversion rate for the control and treatment groups

SELECT "group”, COUNT (DISTINCT u.id) As total users,

Round ((Count (DISTINCT a.uid) \*100.0)/

Count (DISTINCT u.id),2) As conversion\_rate

FROM users as u

LEFT JOIN groups as g

ON u.id=g.uid

LEFT JOIN activity as a

ON u.id=a.uid

GROUP BY "group";

Conversion rate of all users

SELECT

COUNT (DISTINCT a.uid) AS converted\_users,

COUNT (DISTINCT u.id) AS total\_users,

(COUNT (DISTINCT a.uid) \* 100.0 / COUNT (DISTINCT u.id)) AS conversion\_rate

FROM users as u

LEFT JOIN activity as a

ON u.id = a.uid

ORDER BY conversion\_rate;

Average amount spent per user for the control and treatment groups, including users who did not convert.

SELECT "group",

COALESCE(SUM(a.spent),0)As total\_spent,

Count(u.id) As total\_transactions,

Round (COALESCE (SUM(a.spent), 0)/COUNT(DISTINCT u.id),3) As average\_spent

FROM users as u

LEFT JOIN groups as g

ON u.id=g.uid

LEFT JOIN activity as a

ON u.id=a.uid

GROUP BY "group";

Aggregated database

SELECT u.id,sum(a.spent)as total\_sum\_spent,u.country,u.gender,g.device,g.group

FROM users as u

JOIN activity as a

ON u.id=a.uid

JOIN groups as g

ON a.uid = g.uid

WHERE spent >'0'

GROUP BY u.id,u.country,u.gender,g.device,g.group

ORDER BY total\_sum\_spent;

**11.0. Appendix**

Tableau charts

Q.1.<https://public.tableau.com/app/profile/ejikeme.justine.ekwem/viz/Book2_16946308920610/conversionrateandaverageamountspentbetweenthetestgroups_?publish=yes>

Q.2.<https://public.tableau.com/app/profile/ejikeme.justine.ekwem/viz/Book2_16946308920610/Distributionoftheamountspentperuserforeachgroup?publish=yes>

Q3.<https://public.tableau.com/app/profile/ejikeme.justine.ekwem/viz/Book2_16946308920610/RelationshipbetweenthetestmetricsandtheUsersdevice?publish=yes>

Q4.<https://public.tableau.com/app/profile/ejikeme.justine.ekwem/viz/Book2_16946308920610/RelationshipbetweenthetestmetricsandtheUsersgender?publish=yes>

Q5.<https://public.tableau.com/app/profile/ejikeme.justine.ekwem/viz/Book2_16946308920610/RelationshipbetweenthetestmetricsandtheUserscountry?publish=yes>

Dashboard

<https://public.tableau.com/app/profile/ejikeme.justine.ekwem/viz/Book2_16946308920610/Dashboard1?publish=yes>

<https://www.omnicalculator.com/statistics/critical-value#t-critical-values>