

Project Part 3

1. Brief Description

This project investigates whether there is a significant difference in customer perception between two discount types, which are save 25% and save \$25 for a hypothetical product priced at 100 dollars. Using a between-subjects A/B testing design, participants are randomly assigned to view either the percentage discount or the dollar discount. They are then asked to rate the discount type they viewed on three variables, which are attention-grabbing score, discount clarity score, and likelihood of purchase score. Participants are recruited via social media channels like Instagram, where they are invited to participate in a shopping-related experiment. A software tool generates a link that randomly assigns each participant to view one of the discount types. This ensures that each participant views only one version and allows for effective manipulation of the independent variable without crossover between groups.

Key findings from this analysis could provide valuable insights for digital marketers. These insights can help them understand whether choosing between the two versions of the discount type matters for capturing attention, enhancing clarity, and increasing purchase intent. Furthermore, these insights could guide digital marketing strategies by enabling more targeted and impactful discount presentations.

2. Analysis

Independent samples t-tests were conducted to analyze the data for each of the dependent variables, which are attention-grabbing score, discount clarity score, and likelihood of purchase score.

There was no significant difference in attention-grabbing scores between the save 25% version and the save \$25 version after running an independent samples t-test ($t(42) = -0.14, p = .88$). For discount clarity, There was no significant difference in the scores as well between the save 25% version and the save \$25 version after running an independent samples t-test ($t(42) = -1.31, p = .19$). Lastly, for Likelihood of Purchase score, there was no significant difference in the scores as well between the save 25% version and the save \$25 version after running an independent samples t-test ($t(42) = -0.89, p = .38$).

3. Hypothesis and Error Results

The results from the independent samples t-tests for each of the dependent variables, which include attention-grabbing score, discount clarity score, and likelihood of purchase score, did not provide sufficient evidence to reject the null hypothesis. The null hypothesis states that there is no significant difference in scores between the save 25% and save \$25 discount types. The p-values for all the dependent variables were greater than 0.05, which indicates a lack of statistical significance. As a result, we could not reject the null hypothesis.

As we could not reject the null hypothesis, we could be making Type II error. This indicates that there might be an actual difference our study failed to detect. Since the chance of making a Type II error is not provided by the independent samples t-test, we conducted a power analysis using G* Power software and found that the power ($1-\beta$) was 0.25. This indicates that the probability of making a Type II error (β) is 0.75, which is very high.

4. G* Power

A power analysis was conducted to estimate the likelihood of detecting an effect size of Cohen's d of 0.39 with a significance level (α) of 0.05. The total sample size consisted of 44 participants, with 22 participants

in each group. The achieved power ($1-\beta$) of the test was calculated to be 0.25. This result indicates that the study had a 25% chance of detecting a true effect of this magnitude, if one exists. The probability of making a Type II error (β) is therefore 0.75. Such a low power suggests that the study was underpowered to detect the effect size observed. This raises the likelihood that a true effect, if present, went undetected. Please refer to Appendix 2 for the power analysis conducted for this study.

5. Discussion

Our study investigated whether presenting discounts as save 25% or save \$25 influenced key consumer decision-making metrics, which include Attention Grabbing score, Discount Clarity score, and Likelihood of Purchase score. We hypothesized that the discount type would significantly impact these metrics, reflecting varying consumer preferences for percentage-based versus absolute dollar savings. However, our results showed no statistically significant differences between the two groups.

The experiment was conducted with a between-subjects design involving 44 participants, who were randomly assigned to one of the two discount type conditions. Participants were recruited through social media platforms and were asked about their shopping habits. Only individuals who reported making more than five monthly purchases were selected to participate in the study. These participants were then sent an online form that randomly assigned them to either the save 25% version or the save \$25 version, providing a relevant context for evaluating their response to promotional offers. Although the observed effect size (Cohen's $d=0.39$) suggested a small to moderate effect of discount type, the lack of statistical significance indicates that the type of discount alone may not substantially influence consumer perceptions or behaviors. One limitation of the study was the low statistical power ($1-\beta=0.25$), which significantly increases the likelihood of a Type II error, meaning the failure to detect a true effect if one exists. This low power suggests that the sample size may have been insufficient to identify subtle differences between the two discount type conditions. Additionally, the majority of participants fell within the 18 to 24 age group, which may have influenced the findings. The shared demographic characteristics of this group could have reduced variability in responses, limiting the study's ability to detect nuanced differences in the impact of discount type.

The lack of significant differences across all three dependent variables, which are Attention Grabbing score, Discount Clarity score, and Likelihood of Purchase score, suggests that consumers may prioritize factors other than the type of discount. These factors may include the perceived relevance, likability, or value of the product being offered. For example, the type of product being discounted could play a pivotal role. High-priced luxury items may elicit a stronger response to dollar-based discounts, while percentage-based discounts might resonate more with lower-cost, everyday items. It is also possible that participants paid more attention to the product itself rather than focusing exclusively on the discount type when completing the online questionnaire.

Furthermore, individual characteristics such as financial priorities or shopping goals were not controlled in the study, which could have confounded the results. Consumers with a budget-conscious mindset might focus more on the absolute savings represented by dollar-off discounts, whereas those motivated by perceived value or deal-hunting tendencies might respond better to percentage-based discounts. External factors such as brand familiarity, trust in the product, uncertainty about product quality, and prior exposure to similar promotions may also have moderated the effects of discount type, further obscuring any potential differences. Additionally, the psychological perception of a good deal may vary widely among individuals based on personal shopping experiences or cultural influences, adding complexity to the findings.

Despite these limitations, our study contributes to the understanding of consumer behavior by challenging the assumption that discount type plays a pivotal role in decision-making. These results encourage

researchers and digital marketing professionals to consider other elements of promotional strategies, such as the timing and context of offers, in addition to the discount type itself.

In conclusion, while save 25% and save \$25 may resonate differently with consumers, our study suggests that these differences are not substantial enough to meaningfully alter consumer behavior metrics such as attention-grabbing potential, clarity, or likelihood of purchase. Future research should focus on larger and more diverse samples and include additional variables, such as product type and shopping context, to better understand the nuanced impact of discount types on consumer decision-making.

Appendix 1

The feedback for project part-2 was "PERFECT!", so no changes were made to it.

Project Part 1

1. Short Summary

- a. My interests include leveraging technology for social good, with a focus on creating solutions to real-world challenges in areas like education, healthcare, and sustainability. I believe that technology has the unique potential to address issues that affect millions of lives and helping to bridge critical resource gaps.
- b. I'm currently pursuing my Master's degree in Applied Data Science. I chose this field because I've always been fascinated by uncovering patterns in data and wanted to learn the advanced techniques and methodologies that make this possible.
- c. I took this class specifically to learn about experimentation, particularly A/B testing—how to conduct it, analyze the results, and interpret its impact. My interest grew after learning about a case study from Microsoft, where a simple A/B test of showing ads differently in the Bing browser led to a 12% increase in revenue.
- d. My personal ambition to change the world is to tackle societal challenges such as deforestation, the misuse of Earth's resources, and climate change. My drive stems from personal experiences and a strong sense of responsibility, motivating me to innovate solutions and foster collaboration for a sustainable future.
- e. I worked as a Business Analyst for over two years in a financial services company. During this time, I closely collaborated with our digital marketing team on running campaigns, but we often did not use any experimentation techniques to determine which version generated more leads or conversion rates. I chose one such specific topic in this domain to learn and implement A/B testing from scratch.
- f. Screenshot of CITI certification for human subjects research.



2. User Study plan

- a. The variables we will collect for the study include the **Discount Type**, the independent variable that we will manipulate, and the dependent variables, which are the **Attention Grabbing score**, **Discount Clarity score**, and **Likelihood of Purchase score**.
- b. The design of our study is experimental. **Specifically, it is a between-subjects A/B testing design.** In this study, the independent variable, which is Discount Type, is a between-subjects factor, and we do not include any within-subject factors.
- c. **The independent variable in this study is the discount type, while the dependent variables include the Attention Grabbing score, Discount Clarity score, and Likelihood of Purchase score.**
- d. **Independent Variable:**
 - The discount type will be manipulated by presenting participants with one of two versions of a discount offer for a hypothetical product priced at \$100, either save 25% or save \$25. Each participant will be randomly assigned to one of the online forms and will only see one version of the discount.

Dependent Variables:

- Attention Grabbing score is measured by participants' ratings on how attention-grabbing they find the discount offer, using a 5-point Likert scale (1 = Less attention-grabbing to 5 = Extremely attention-grabbing) after viewing the offer in an online form.
- Discount Clarity score is measured by participants' ratings on how easy it is to understand the discount offer, using a 5-point Likert scale (1 = Least clear to 5 = Very clear) in an online form.
- Likelihood of Purchase score is measured by participants' ratings on their likelihood of purchasing the product, using a 5-point Likert scale (1 = Less likely to 5 = Very likely)

after viewing the discount offer. Participants are instructed to assume that they are interested in buying the product.

- e. This study will focus on individuals aged 18 and older. We will distribute a single survey link that randomly assigns participants to either the save 25%" or save \$25 version of the survey. The survey will be shared through social media platforms, including Instagram, X, WhatsApp community groups, and LinkedIn. To engage potential participants, we will reach out to our followers and invite them to participate in a short survey about a shopping-related experiment. The random assignment will be managed using a tool called Allocate Monster, which ensures that each participant is randomly assigned to one of the two versions. The survey will first ask participants to confirm that they are 18 years or older before they can proceed. Our goal is to recruit approximately 50 participants, with 25 assigned to each version, to allow for a meaningful analysis of the results.

3. Analysis plan

- a. The research questions for this study are as follows: For the Attention Grabbing score, the question is, 'Does the discount type cause participants to find the offer more attention-grabbing?' For the Discount Clarity score, the question is, 'Does the discount type cause participants to find the offer easier to understand?' Lastly, for the Likelihood of Purchase score, the question is, 'Does the discount type cause an increase in participants' likelihood of purchasing the product given the discount?' These research questions can be answered using data collected from participants' ratings on Likert scales for the Attention Grabbing score, Discount Clarity score, and Likelihood of Purchase score, based on the specific discount type presented to them in the online form.
- b. Following is the analysis plan. The null hypothesis states that there is no significant difference between scores, while the alternative hypothesis states that there is a significant difference between scores.
 - Attention Grabbing score: We will perform an independent samples t-test to compare the Attention Grabbing scores of participants exposed to the two different discount types. It is because IV (Discount type) is categorical with 2 levels and DV (Attention Grabbing score) is continuous.
 - Discount Clarity score: We will perform an independent samples t-test to compare the Discount Clarity scores of participants exposed to the two different discount types. It is because IV (Discount type) is categorical with 2 levels and DV (Discount Clarity score) is continuous.
 - Likelihood of Purchase score: We will perform an independent samples t-test to compare the Likelihood of Purchase scores of participants exposed to the two different discount types. It is because IV (Discount type) is categorical with 2 levels and DV (Likelihood of Purchase score) is continuous.

Project Part 2

1. Short Description

This project investigates whether there is a significant difference in customer perception between two discount types, which are save 25% and save \$25 for a hypothetical product priced at 100 dollars. Using a between-subjects A/B testing design, participants are randomly assigned to view either the percentage discount or the dollar discount. They are then asked to rate the discount type they viewed on three variables, which are attention-grabbing score, discount clarity score, and likelihood of purchase score. Participants are recruited via social media channels like Instagram, where they are invited to participate in a shopping-related experiment. A software tool generates a link that randomly assigns each participant to view one of the discount types. This ensures that each participant views only one version and allows for effective manipulation of the independent variable without crossover between groups.

Key findings from this analysis could provide valuable insights for digital marketers. These insights can help them understand whether choosing between the two versions of the discount type matters for capturing attention, enhancing clarity, and increasing purchase intent. Furthermore, these insights could guide digital marketing strategies by enabling more targeted and impactful discount presentations.

2. Dataset Description

Assuming the dataset before any pre-processing, we will have two sets of data, one for each version of the discount type, containing responses from participants recruited through social media platforms for our between-subjects A/B testing study. Each row in the dataset will represent one participant's response. For the two versions of the discount type in our study, we will have three scores ranging from 1 to 5, which are Attention Grabbing score, Discount Clarity score, and Likelihood of Purchase score. In addition to these scores, the dataset will also include other details such as the participant's email ID, age, and the timestamp of their response.

The key variables based on the research questions for the study in the dataset, which will be used in further analysis with statistical tests, are the Discount Type, Attention Grabbing score, Discount Clarity score, and Likelihood of Purchase score. The Discount Type is the independent variable, as it was manipulated in this user study, while the dependent variables include Attention Grabbing score, Discount Clarity score, and Likelihood of Purchase score. The independent variable, which is the Discount Type, is categorical and has two levels, namely save 25% and save \$25. The dependent variables, which are attention-grabbing score, discount clarity score, and likelihood of purchase score, are continuous variables, as participants rate them on a Likert scale from 1 to 5.

3. Data Preprocessing

Following are the data pre-processing steps we are planning to do:

- The initial step involves merging data from both discount types into a single, unified dataset. We will add a new variable called Discount Type to indicate which discount each participant saw, coding responses as save 25% for participants assigned to the percentage discount and save \$25 for those assigned to the dollar discount.
- Data cleaning will include several steps to ensure the dataset's correctness. First, we will filter the data to include only participants who are 18 years or older. To handle duplicate responses, we will

check for unique entries based on email ID. If any participant attempted both discount versions, we will exclude their responses to prevent cross-condition contamination. For participants who completed the same version more than once, we would only consider the first response with the help of a response timestamp to capture the first initial instincts of the customer. Then, we will remove fields not required for analysis, such as the timestamp of each response, age, and email ID field to maintain participant anonymity.

- To maintain data integrity, outlier detection will be performed on each dependent variable. We will use the interquartile range (IQR) method to identify potential outliers as it's more suitable for Likert scale data. We would review them and decide whether to keep or remove them.
- We wouldn't need any specific handling of missing data as questions would be made mandatory. This approach minimizes the likelihood of missing values.
- We will ensure effectiveness of t-test results by making sure that each group size is roughly equal. For example, we would only consider the minimum group size for the other group as well. Also, we would make sure that the Likert scale range is from 1 to 5 for all dependent variables for both versions.
- In the final step, we will reformat the dataset for ease of analysis. We will create separate columns for each discount version to support straightforward comparisons. For example, columns like "Attention Grabbing Score_Version Save 25%" and "Attention Grabbing Score_Version Save \$25" will be added for each of the three primary variables, allowing us to track responses for each version distinctly.

4. Analysis and Hypothesis

To compare the scores of participants exposed to the two distinct discount types, we will use independent samples t-tests for each of our three dependent variables, which are the Likelihood of Purchase Score, the Discount Clarity Score, and the Attention Grabbing Score. The independent samples t-test is suitable for this analysis since each dependent variable is continuous and the independent variable is categorical with two levels.

For each dependent variable, one test statistic will be generated. In the case of Attention Grabbing Score, the Null Hypothesis states that there is no effect of the type of discount offer on the Attention Grabbing score, whereas the Alternative Hypothesis is that there is an effect of the type of discount offer on the Attention Grabbing score. In the case of Discount Clarity Score, the Null Hypothesis states that there is no effect of the type of discount offer on the Discount Clarity score, and the Alternative Hypothesis is that there is an effect of the type of discount offer on the Discount Clarity score. For the Likelihood of Purchase Score, the Null Hypothesis is that there is no effect of the type of discount offer on the Likelihood of Purchase score, whereas the Alternative Hypothesis states that there is an effect of the type of discount offer on the Likelihood of Purchase score.

Appendix 2

The screenshot below shows the power analysis conducted for our study using G*Power software.

