

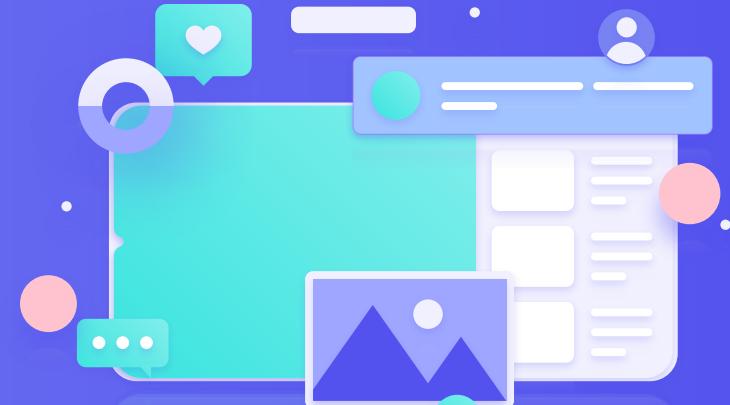
Vanguard A/B test Analysis

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Introduction



Vanguard is a US-based investment management company. They believe that a more intuitive and modern User Interface (UI), coupled with timely in-context prompts (cues, messages, hints, or instructions provided to users directly within the context of their current task or action), could make the online process smoother for their clients.



Hence, an A/B test experiment was conducted between 3/15/2017 to 6/20/2017 with Control (traditional) and Test (new UI) groups on their web page following similar steps (initial page, step 1, step 2, step 3 and confirm).

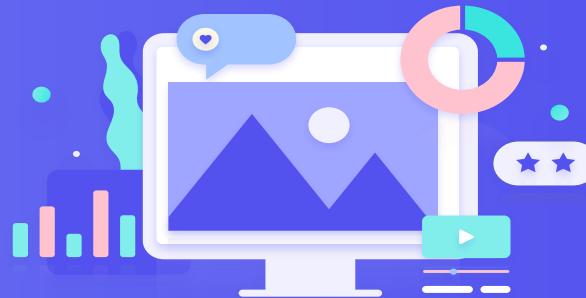
The main question is then:

Would these changes encourage more clients to complete the process?

Data Overview



- ❑ Client Profiles (df_final_demo): Demographics like age, gender, and account details of the clients.
- ❑ Digital Footprints (df_final_web_data): A detailed trace of client interactions online, divided into two parts: pt_1 and pt_2.
- ❑ Experiment Roster (df_final_experiment_clients): A list revealing which clients were part of the grand experiment.



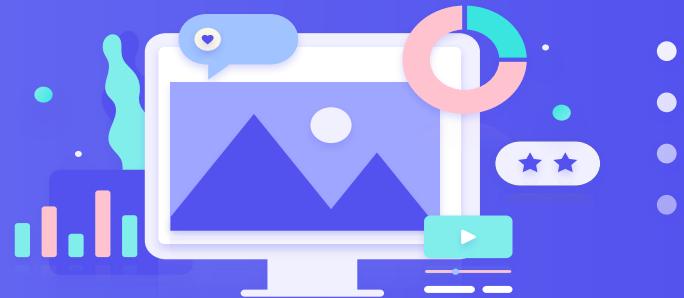
Data Clean Files



- ❑ df_online.csv: Clients that were a part of the experiment with demographic information and a part of the experiment groups.
- ❑ df_ab.csv: The demographic information of the clients that were a part of the experiment as well as their web interactions within the experiment with time and date per step.
- ❑ df_test.csv: Filtered data (stemming from df_ab) belonging to the test group of the experiment.
- ❑ df_control.csv: Filtered data (stemming from df_ab) for control group in the experiment.

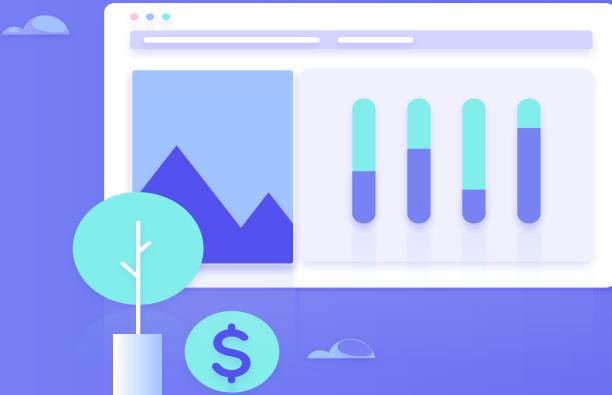


Data Clean Files



- ❑ df_control_time_each_step: Dataframe in sequential order for process step made to calculate the Difference on steps for the control group.
- ❑ df_test_time_each_step: Dataframe in sequential order for process step made to calculate the Difference on Steps for the test group.

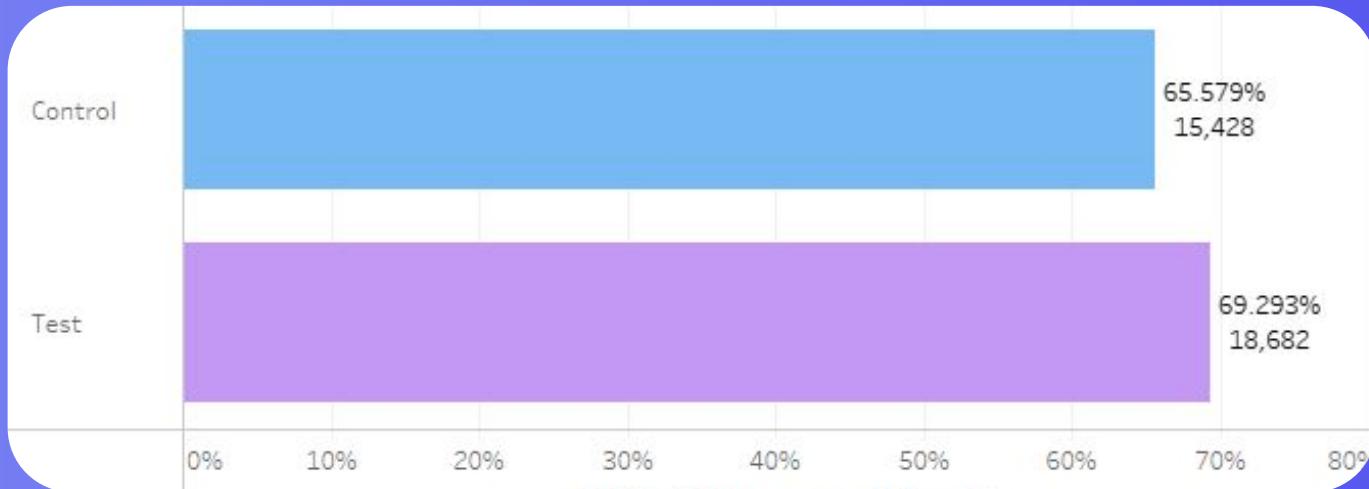
Exploratory Data Analysis Highlights :



- Age for control and test groups represents the demographics of Vanguards customers which is middle age. The average and median both were around 47 to 50 years old
- There is a high amount of customers whose gender is undetermined: 34% of clients, The test group shares 18.35%, and the control has 16%
- When completing the process steps, the average age is similar among the steps.
- **Completion Rate:**
 - **Control Group: 65.58%**
 - **Test Group: 69.29%**

Performance Metrics

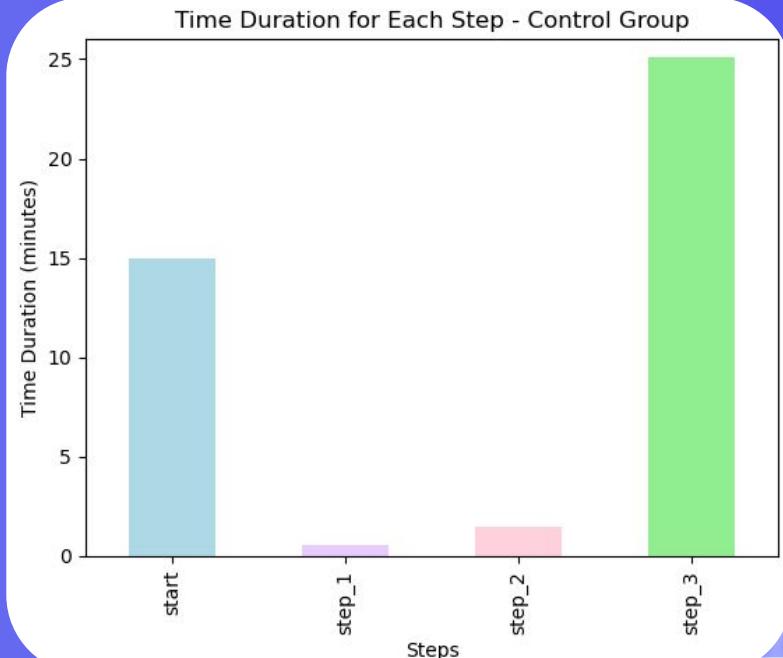
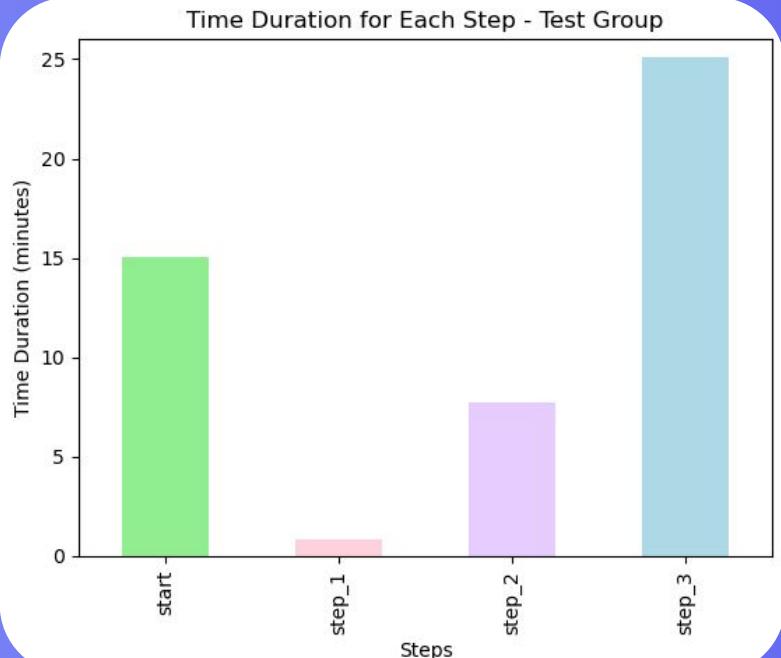
Completion Rate: The proportion of users who reach the final 'confirm' step.



Performance Metrics



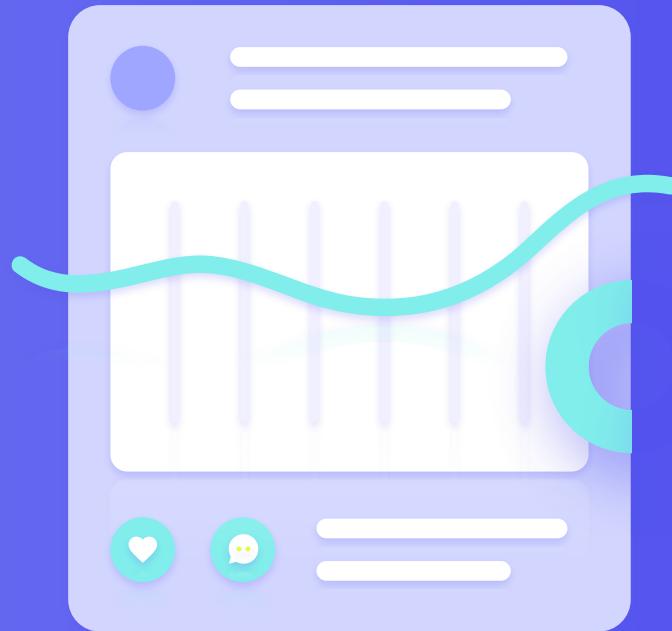
Difference on steps: The average duration users spend on each step.



Hypothesis Testing

Completion Rate

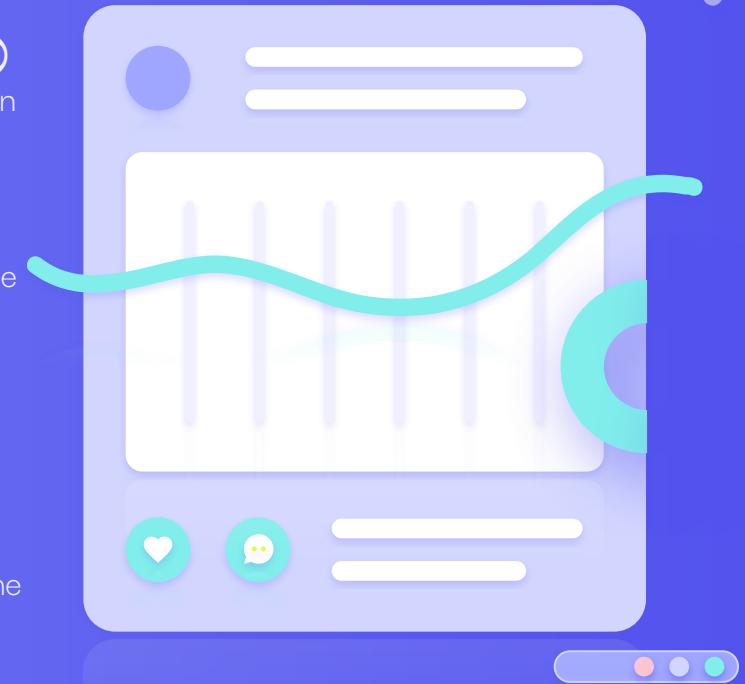
- **Null Hypothesis:** There is no difference between the completion rate between the Test Group and Control Group.
- **Alternate Hypothesis:** There is a difference between the completion rate of the Test Group and the Control Group.
- **Chi-square test Result:** Completion Rate is significant, and there is a difference between the completion Rate of the Groups. Alternative Hypothesis is true.



Hypothesis Testing

Completion Rate with a Cost-Effectiveness Threshold (5%)

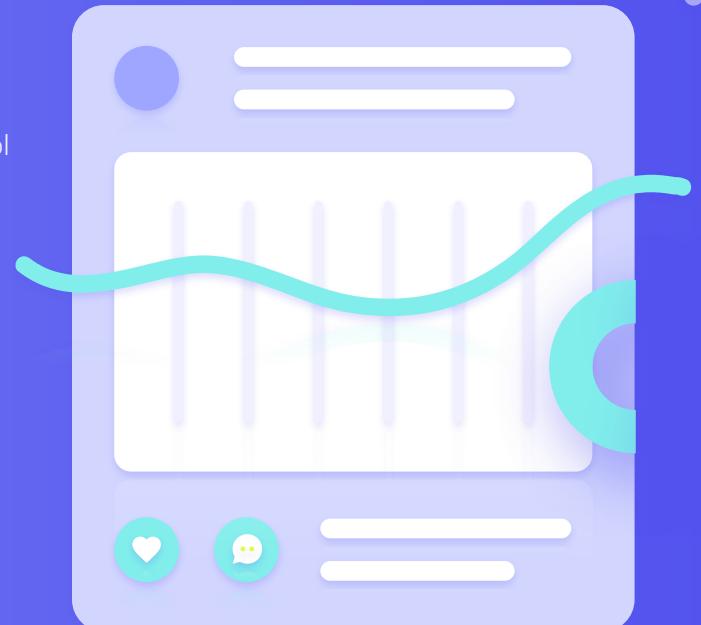
- **Null Hypothesis:** There is no difference between the completion rate between the Test Group and the control Group.
- **Alternate Hypothesis:** There is a difference between the completion rate of the Test Group and the control Group and the difference is more than 5%.
- **Proportions Z-Test Result:** Completion Rate is significant, However it does not meet the threshold. The difference is only 3.71%. Hence, we do not reject the Null Hypothesis.
- **Conclusion:** Although the difference is statistically significant, the experiment associated cost does not meet expectations that were set.



Hypothesis Testing

Difference on steps

- **Null Hypothesis:** There is no difference between the average time taken for each step between the Test Group and the Control Group
- **Alternative Hypothesis:** There is a significant difference between the average time taken for each step between the Test Group and the Control Group
- **T-test individual samples Result:** The means of the time per step are not significantly different. The Null Hypothesis holds.



Experiment Evaluation

Design Effectiveness

- Due to A/B testing being a good way to measure proposed changes for a web page, we believe the experiment was well structured.
- Although the sample size for Test and Control were not the same, it was a small difference and it did not influence the outcome.
 - Control: 26,672
 - Test: 23,391
- No bias was detected from the data as the used variables distribution is similar.



Experiment Evaluation

Timeframe

- The Timeframe was enough to have more than 50,000 Clients as part of the experiment for a period of 3 months.

Distribution

- The model for the experiment and its groups was similarly divided across gender and age as we found in our analysis.

Data Needs

- For gender, it would be beneficial to the analysis to have the undetermined data classified as Male, Female, and/or other.

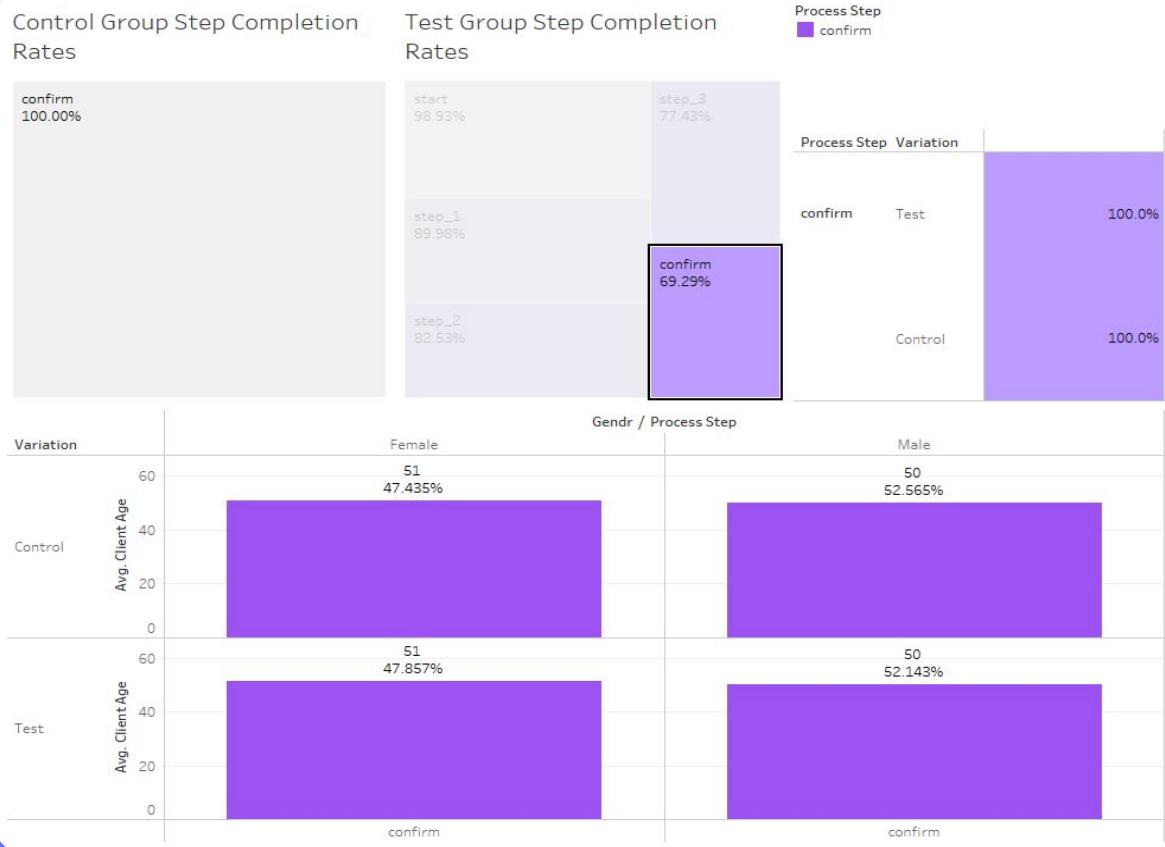


Tableau Dashboard



Tableau Filter

Process step = confirm



Teamwork & Project Management

Steps Week 1 Week 1 Week 2 Week 2

Project Setup



Data Wrangling



EDA



Tableau



Presentation



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Challenges & Learning

- Time management - EDA vs Hyp. Testing
- Visualizations for performance metrics
- Time Delta type for visualizations in Tableau
- Tableau Dashboard into Google Slides



Data Analyst Comments

“Time management is
your real enemy”

“I will master Tableau
another day...”

“Hypothesis Testing is
not for the weak :(”



Conclusions

Would these changes encourage more clients
to complete the process?

Conclusions

Although the difference is statistically significant, the experiment associated cost does not meet expectations that were set.

Thanks!

Do you have any questions?

<https://github.com/baonline>

<https://github.com/redsun498>

<https://github.com/edwardo2013>

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