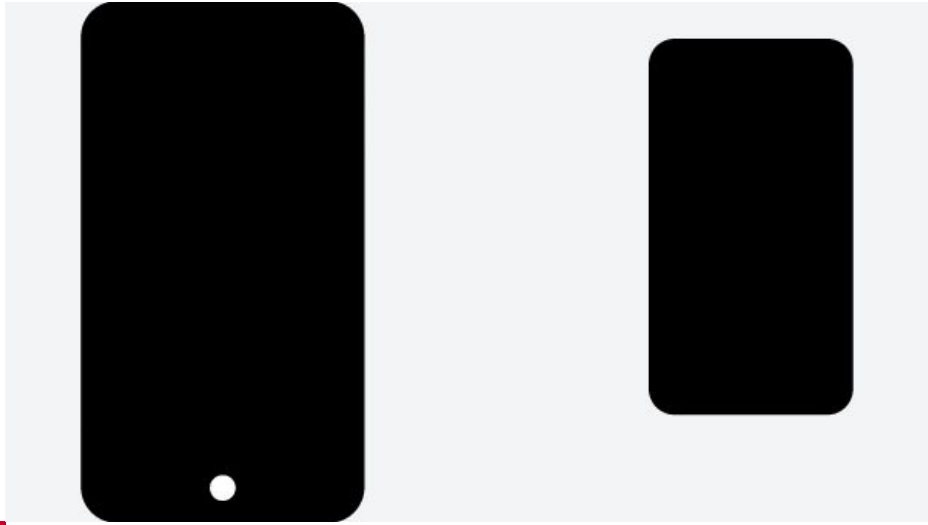


IronHack Data Analytics

WEEK 5 & 6 | VANGUARD A/B TESTING

Agenda

- The Vanguard Group
- Data Overview
- Exploratory Data Analysis
- Performance Metrics
- Hypothesis Testing
- Experiment Evaluation
- Tableau Visualizations
- Teamwork & Project Management
- Challenges & Learning
- Conclusion

The Vanguard Group, Inc.

Vanguard®

- Largest mutual fund company in the world
- Second-largest provider of ETFs (exchange-traded funds)
- Considered a solid choice for both novice and experienced investors looking for low-cost, diversified investment options

Introduction Vanguard A/B Test

Key Questions :

1. **Did the New UI allow clients completing steps in less time?**
2. **Would the redesigned interface help clients reducing errors?**
3. **Did the new UI lead to higher completion rates?**

Data Overview

Client Profiles

df_final_demo

- Key demographics :
  - **Age**
  - **Gender**
  - **Account details**
- Helps segment users and understand **Customer behavior**

Experiment Roster

df_final_experiment_clients

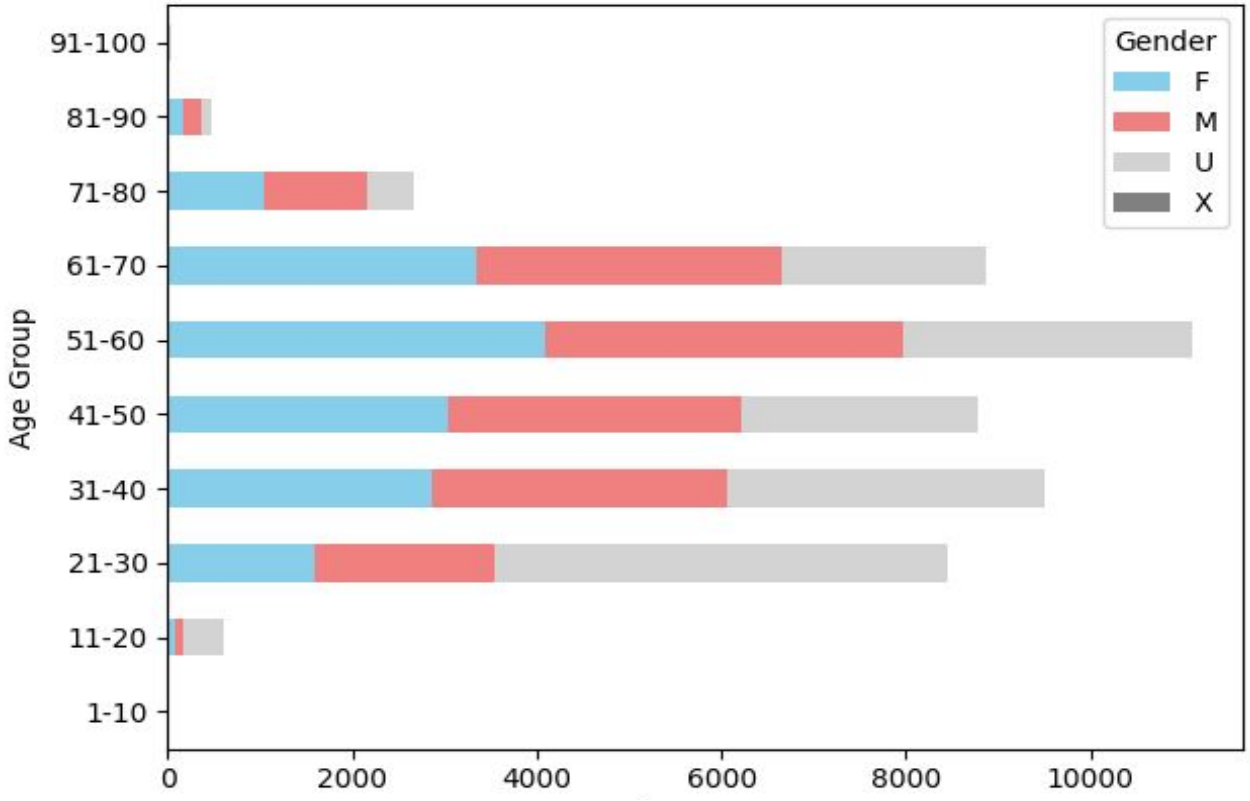
- Identifies **clients included in the A/B test**
- Used to **compare test vs control group behaviours**
- Measuring the **impact of new features**

Digital Footprints

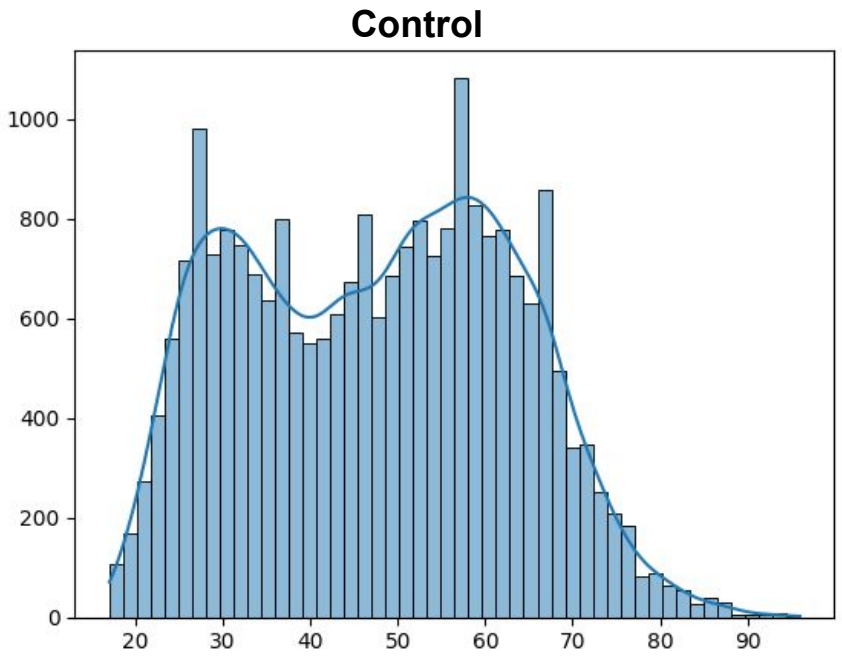
df_final_web_data

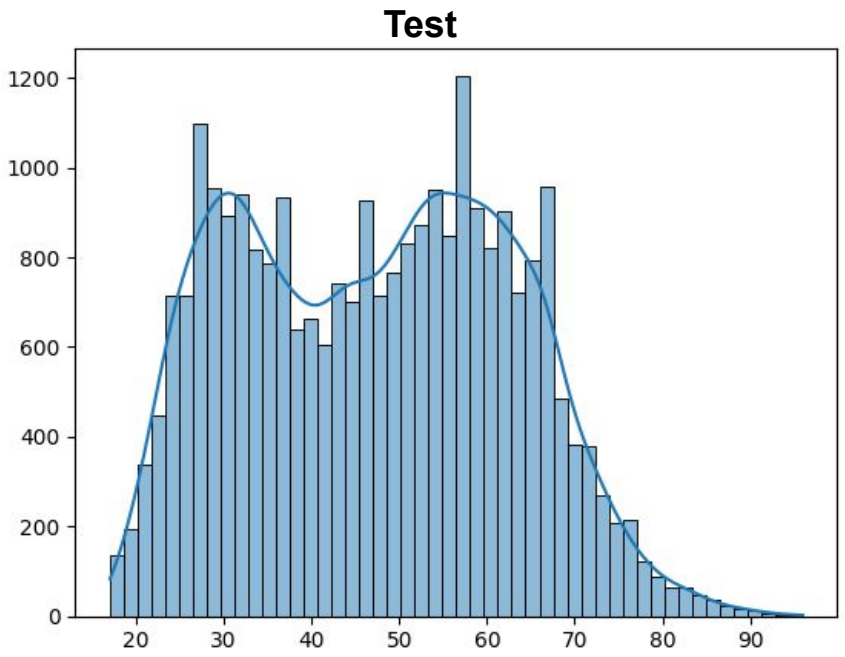
- Logs client interactions online
- pt_1 and pt_2 must be **merged for full analysis**

EDA - Age Group by Gender

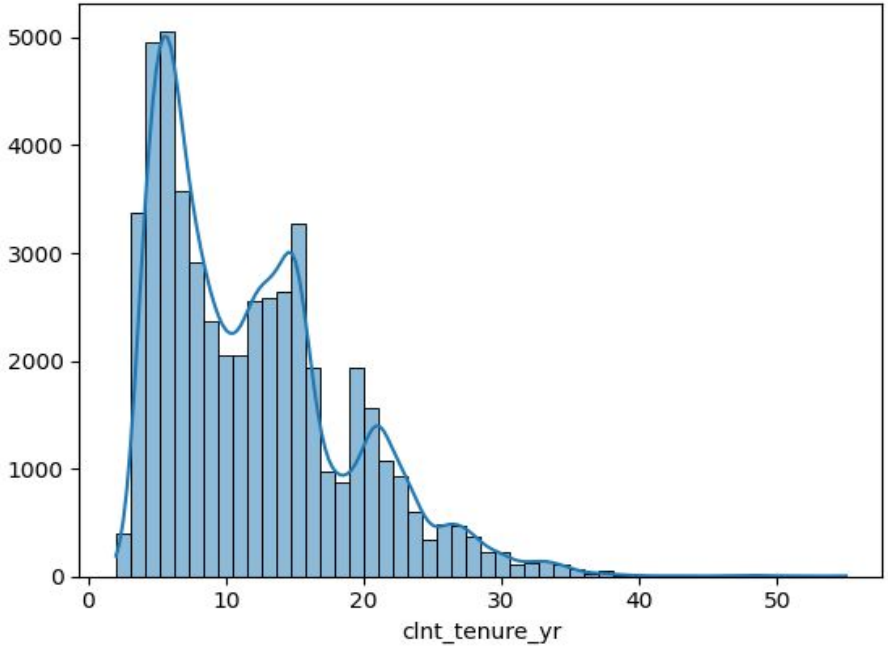


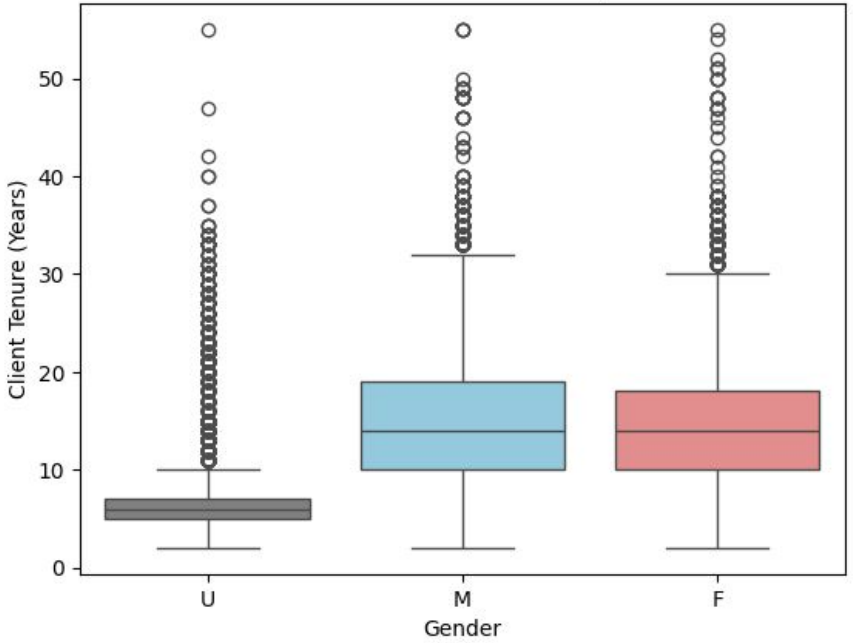
EDA - Clients Age





EDA - Clients Tenure





Performance Metrics

Completion Rate

(visit_id reached “confirm” step / Total visit_id that started) ×100%

Mean Time Difference (Sec.)

AVG(SUM(Time difference between each step per visit_id))

Total Error Rate

(Total count of step_regression / Total count of process_step) ×100%

Error Rate per step

(visit_id with at least one step regression / Total visit_id that reached the step) ×100%

Hypothesis Testing

- **User Completion Rate** → *One-Sided Proportion Z-Test*
  - H0: Completion rate - Test **>=** Completion rate - Control
  - H1: Completion rate - Test **<** Completion rate - Control
- **Total Error Rate** → *One-Sided Proportion Z-Test*
  - H0: Error rate - Test **<=** Error rate - Control
  - H1: Error rate - Test **>** Error rate - Control
- **Total Time** → *Independent or Welch's t-test*
  - H0: Total mins mean - Test **<=** Total mins mean - Control
  - H1: Total mins mean - Test **>** Total mins mean - Control

Hypothesis Testing

- **User Completion Rate** → *p-value: 1.00 > α 0.05*
  - **H0: Completion rate - Test >= Completion rate - Control**
  - H1: Completion rate - Test **<** Completion rate - Control
- **Total Error Rate** → *p-value: 0.00 < α 0.05*
  - H0: Error rate - Test **<=** Error rate - Control
  - **H1: Error rate - Test > Error rate - Control**
- **Total Time** → *p-value: 0.001 < α 0.05*
  - H0: Total mins mean - Test **<=** Total mins mean - Control
  - **H1: Total mins mean - Test > Total mins mean - Control**

Hypothesis Testing

- **Completion Rate with 5% Cost-Effectiveness Threshold**
  - H0: Completion rate - Test <= Completion rate - Control +5%
  - **H1: Completion rate - Test > Completion rate - Control +5%**

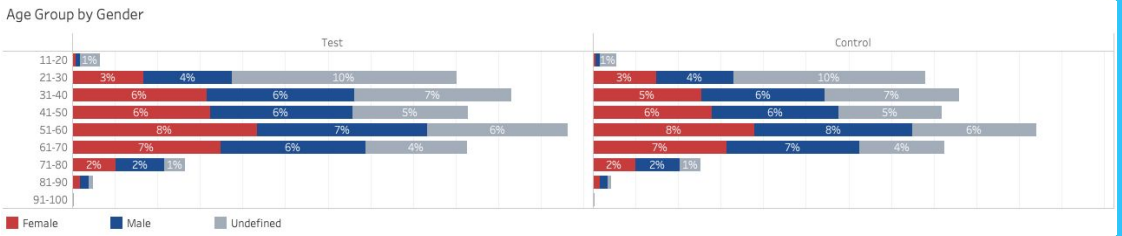
p-value = 0.0000 > *α* *0.05* → Test group improves Control group completion rates +5%

Experiment Evaluation

- Experiment Design
  - **Randomization** (group size (client_ids) total sessions (visit_id), gender & age distribution similar)
  - **Duration period** seems acceptable
  - **Potential bias** cannot be ruled out completely, but given above stated group design seems marginal

- Missing breakdown in new features per process step (vs. original) limits effective evaluation
  → **additional information on features changes beneficial**

	Group	Total Sessions
0	Control	32189
1	Test	37136



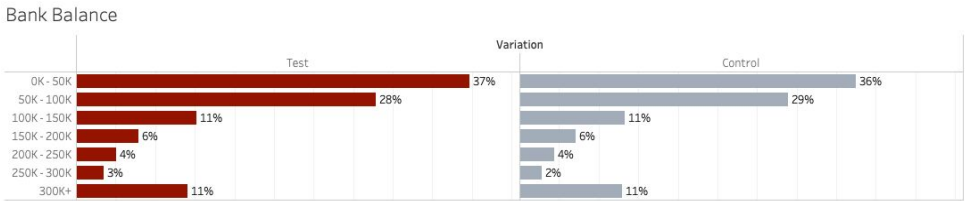


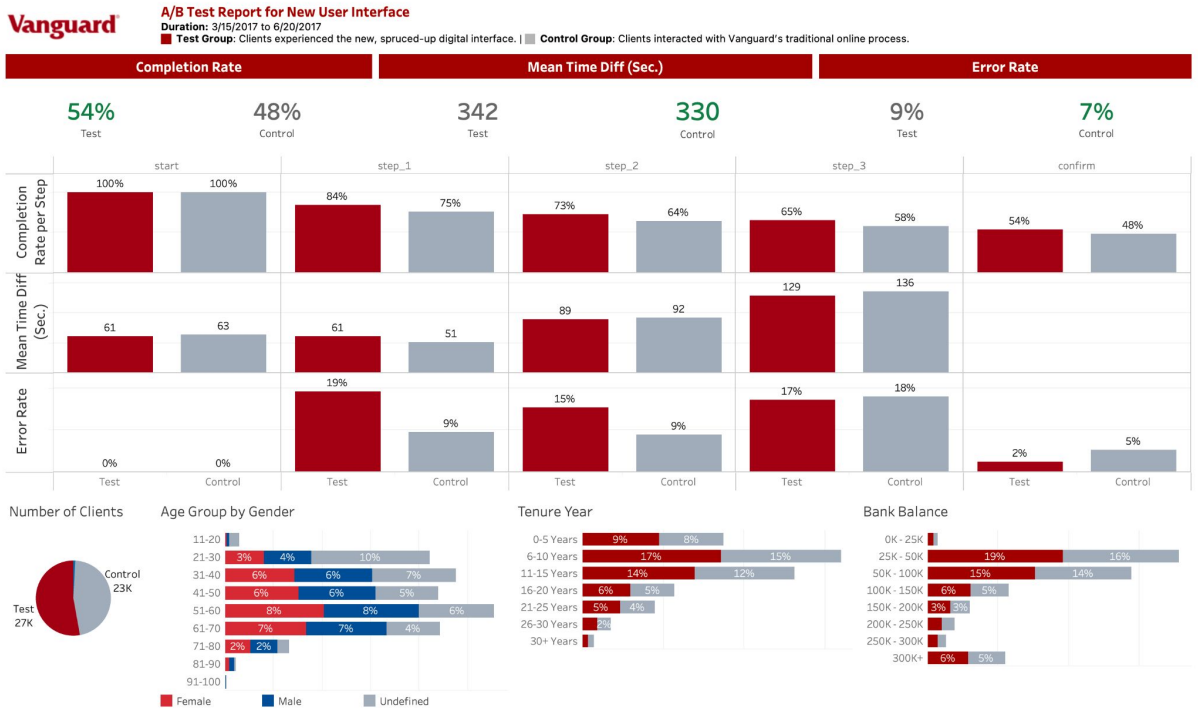
Tableau Visualizations

Header

Major Success Indicators

Performance per Step

Demographics



Business conclusions

- The new interface encouraged more users to complete the process (completion rate test : 54% vs control : 48%), but also led to higher error rates, longer to complete, particularly in step 1 and 2
-
- Step 1: Error rate doubled in the test group -> users struggle with the new UI early in the process (unclear navigation or instructions)

  Step 2: even error rate is higher, took less time
  Step3: test group performed better in all 3 KPIs, less ER

  Confirm: Test group maintained its advantage

- Completion rate drops significantly for the older clients (70+): 38%

- Suggestions for improvement:
  - Optimize UI for speed
  - Reduce error rate with better guidance -> provide real-time feedback, e.g. via tool-tip notifications when using the process for the first time
  - Enhance accessibility for older users -> increasing font size, simplifying complex interactions (i.e. Step 3)

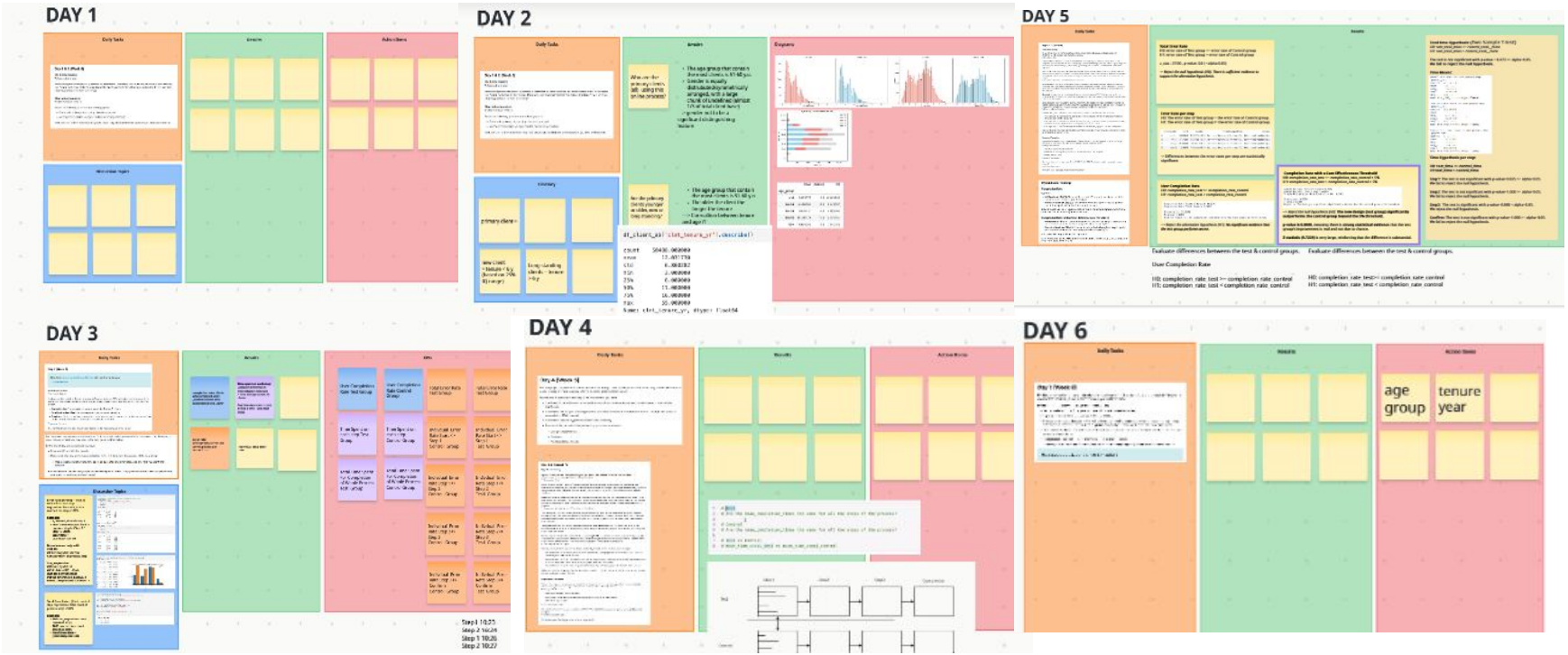
Business conclusions

- Recommendations for next step:
  - Further segmentation analysis
  - User session recordings to track where users get stuck
  - Collect user feedback

Conclusions

Yes, the new UI feature led to a higher completion rate (based on the results of hypothesis testing of completion rate with 5% cost-effectiveness threshold) ✓

Teamwork & Project Management



Challenges & Learning

- Selecting Hypothesis testing methodology can be overwhelmingly challenging
- Implementing the calculated fields on Tableau
    - Ensuring user-selected filters like Age group do not alter the fixed baseline calculation
- Dashboard design for clear visualization of the performance KPIs
- Learnings
    - Combining LOD and Table Calculations: LOD({FIXED}) with WINDOW_MAX()
    - Practical debugging for testing calculation systematically
    - Consistent color schemes

PROJECT VANGUARD A/B Testing

THANKS !

Lukas Günther| Rebecca Woo | Sandra Ngoing | Víctor Ramírez