

Design Meets Data

A Journey Through A/B Test Findings



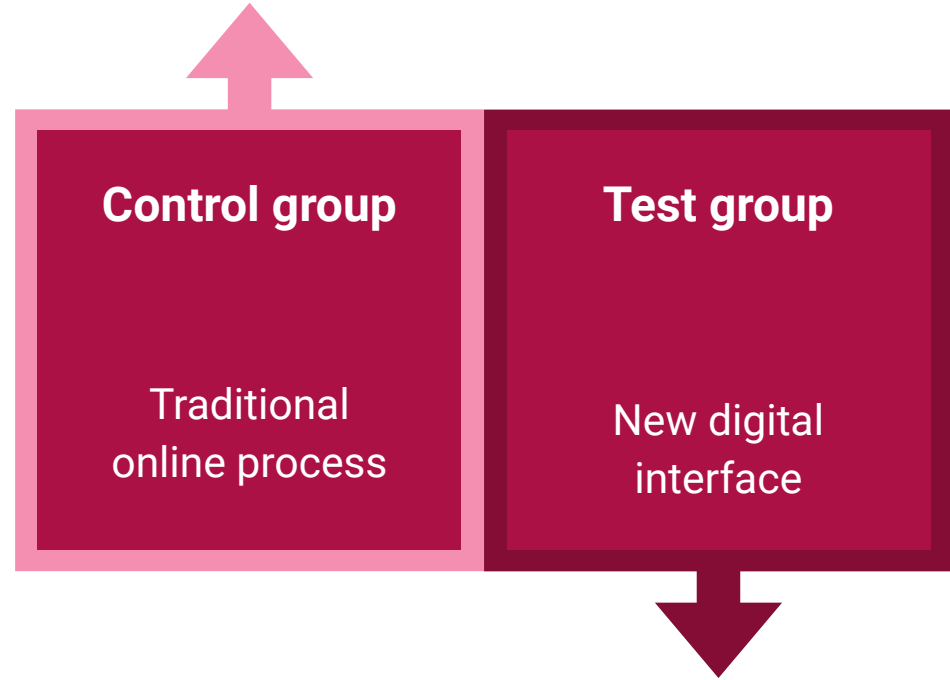
Amirreza & Lorena

Vanguard

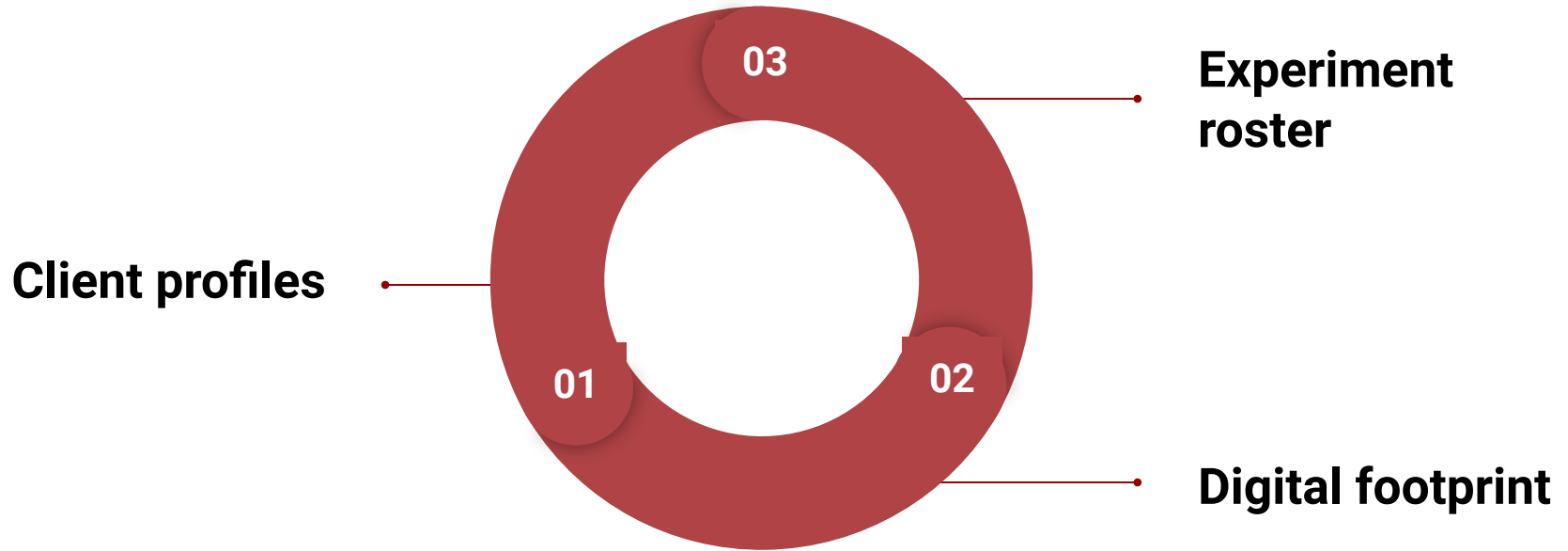
- Vanguard is one of the world's most respected investment management companies, offering a broad selection of **investments, advice, retirement services**, and **insights** to individual investors, institutions, and financial professionals.
- Purpose: To take a stand for all investors, to treat them fairly, and to give them the best chance for investment success.

The digital experiment

A/B Test for 98 days
(3/15/2017 - 6/20/2017)



Data overview



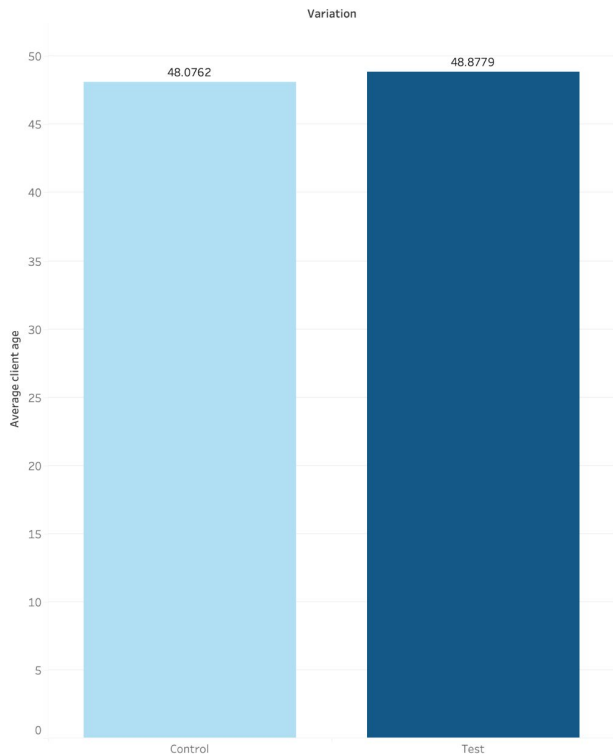
Data cleaning and merging

- Merge the datasets
- Drop missing values
- Create new columns
- Separate data sets (Test and Control)

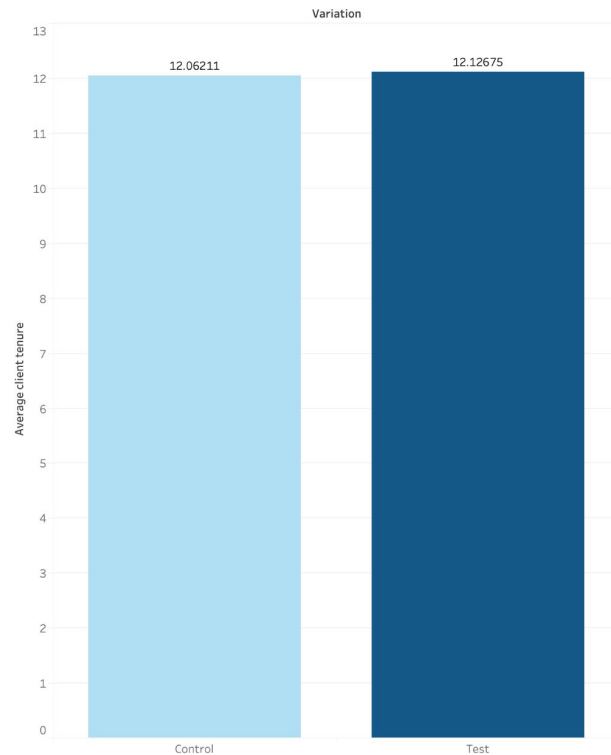
Test and Control Groups Comparison

Distribution of customers by age and tenure

Average clients age in test and control groups

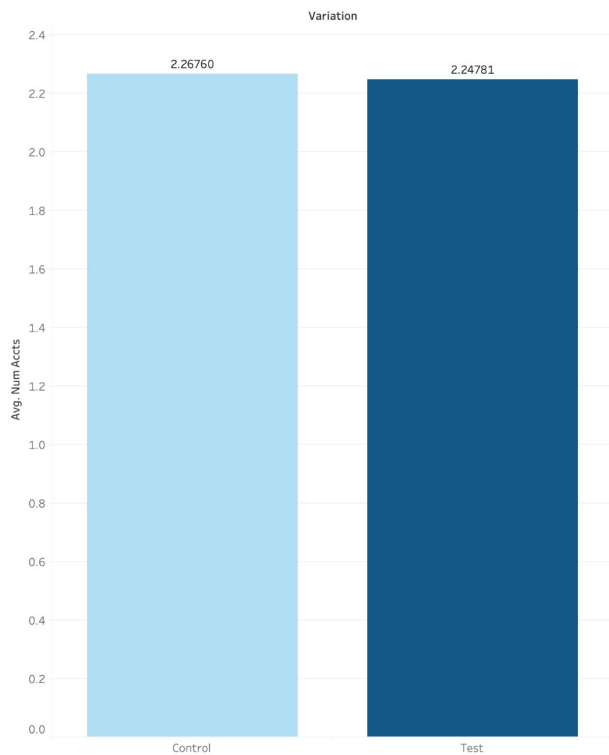


Average clients tenure in test and control groups

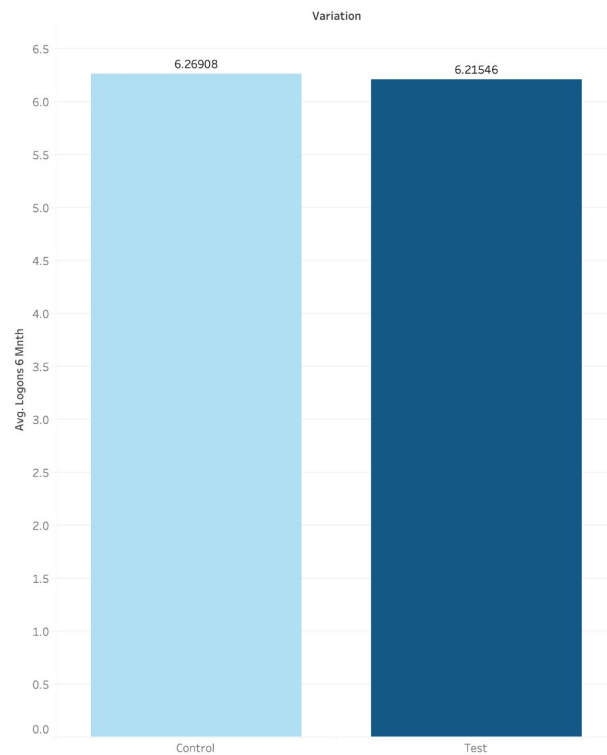


Distribution of customers by number of accounts and logins

Average number of accounts in test and control groups



Average logins in 6 months in test and control groups

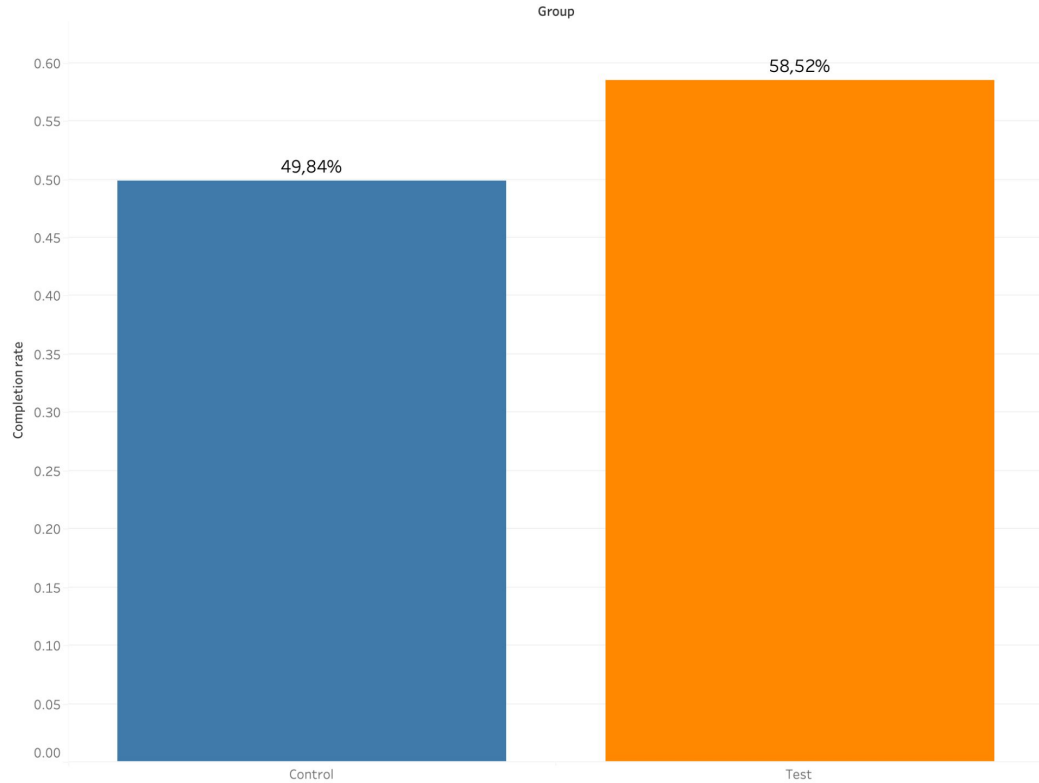


Performance metrics

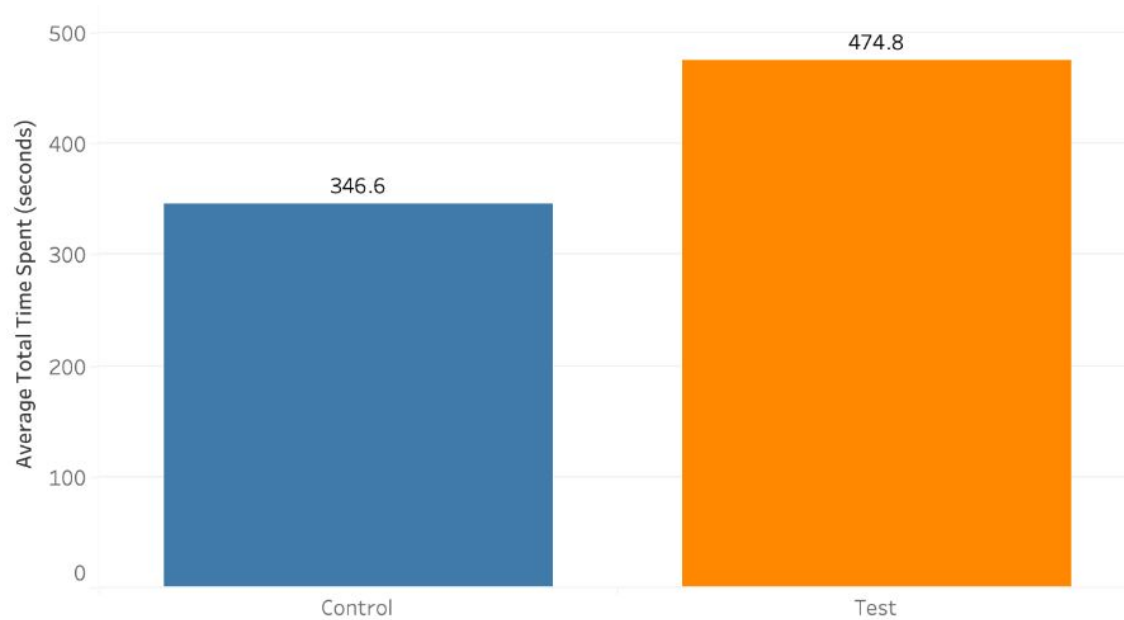
Performance Metrics

- Completion rate
- Time Spent in the process
- Error rate

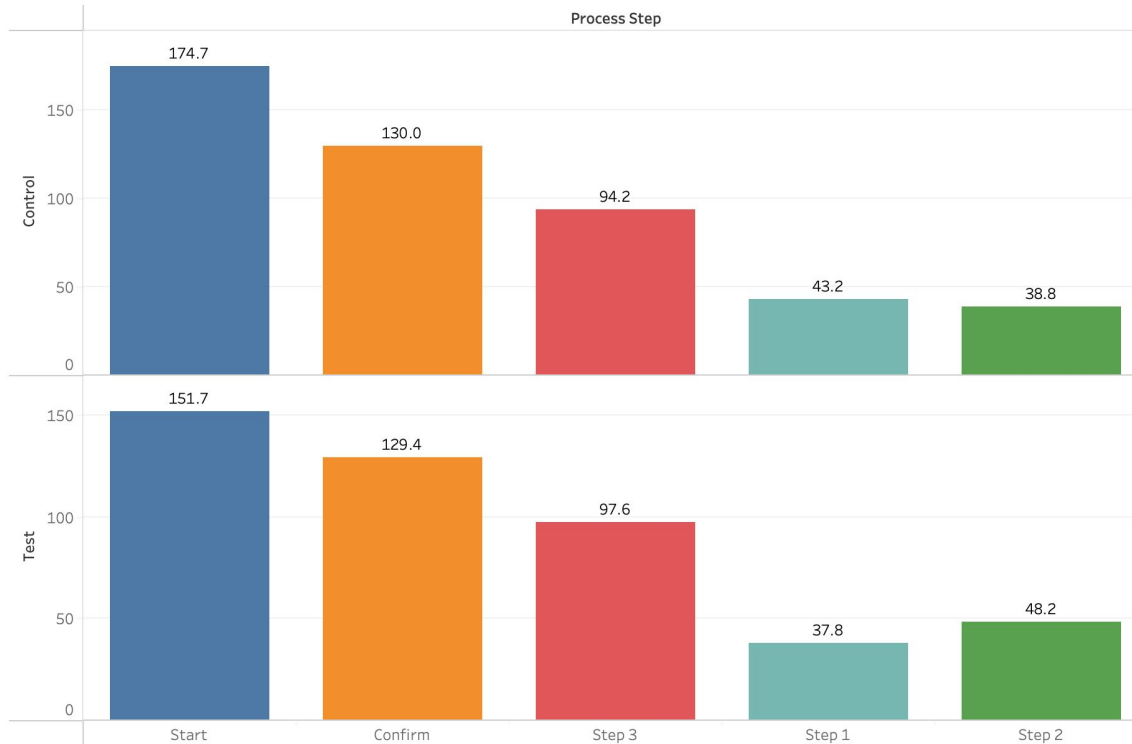
Completion rate



Total time spent in the process

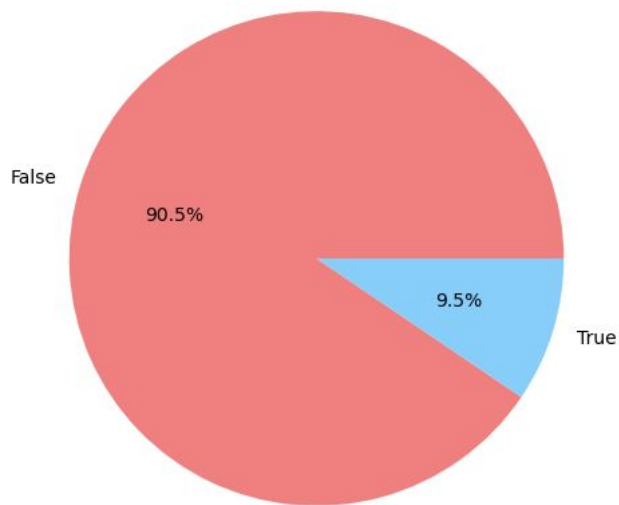


Total time spent on each step

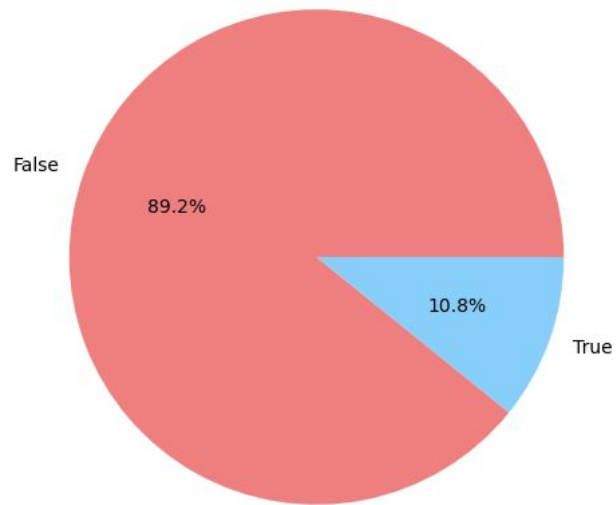


Error rate

Control Group Error Rate



Test Group Error Rate



Hypothesis Testing

Hypothesis testing

KPI		H0	H1	Results
1	Completion rate		✓	<ul style="list-style-type: none">• Z-Statistic= 22.89• $p < .001$
2	Total time spent in the process		✓	<ul style="list-style-type: none">• t-Statistic= 11.37; $p < .001$• U-Statistic= 4,426,175.0; $p < .001$
3	Mean time spent on each step		✓	<ul style="list-style-type: none">• t-Statistic -6.27; $p < .001$ (start)• t-Statistic -2.53; $p = .006$ (step 1)

Hypothesis testing (y=total time spent)

Independent variables		H0	H1	Results
1	Tenure years	✓		<ul style="list-style-type: none">coef= -.7574p=.538
2	Age		✓	<ul style="list-style-type: none">coef= 5.7533p<.001
3	Balance	✓		<ul style="list-style-type: none">coef= 6.622p=.770
4	Calls		✓	<ul style="list-style-type: none">coef= -7.8541p=.028
5	Group (dichotomic)		✓	<ul style="list-style-type: none">coef= 48.8970p=.002

Key findings

Key findings

- The test group has a greater completion rate:
 - The changes encourage more clients to complete the process.
- The test group spent more time in the process:
 - We need to improve the step 2 and step 3 of the new website

Prototype customer (2.28 minutes)

- 10 tenure years
- 46 years old
- \$111,208 in balance
- 2 accounts
- 3 calls in 6 months
- 6 logins in 6 months



Evaluation and Recommendations

Experiment evaluation

1	Design		✓	<ul style="list-style-type: none">• Short-term focus
2	Potential biases	✗		<ul style="list-style-type: none">• New potential customers
3	Randomization		✓	<ul style="list-style-type: none">• Both groups are very similar
4	Duration		✓	<ul style="list-style-type: none">• 3 months

Recommendations

- Apply a customer satisfaction survey to collect more data and measure more KPIs → engagement and customer satisfaction score
- Collect the correct data for the variable Gender
- Having more demographic data for a more accurate evaluation

Challenges and learnings

Challenges and learnings:

- The size of the dataset
- Applying hypothesis tests

Thank you

Amirreza and Lorena