Multi-Touch Attribution Modeling

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OBJECTIVES

OBJECTIVE 1

To attribute **weights of importance** to each digital marketing channel

OBJECTIVE 2

To analyze **channel efficiency and effectiveness** through economic analysis

OBJECTIVE 3

To explore **customer journey** of digital marketing interactions leading to point of sale

Agenda

Attribution Models

Data Driven Attribution Model
Sharpley Attribution Model
Markov Chain Attribution Model

Economic Analysis

Cost Per Action
Return On Advertising Spend

Customer Journey

Transition Matrix
Customer Journey Duration

DATA OVERVIEW

Campaign Dataset – Cookie Level

cookie	time	interaction	conversion	conversion_value	channel
0Ao79E7khB7AffonoBBAofoAi	2018-07-30T07:38:56Z	impression	0	0	Instagram
0Ao79E7khB7AffonoBBAofoAi	2018-07-31T07:41:55Z	impression	0	0	Facebook
0Ao79E7khB7AffonoBBAofoAi	2018-07-31T07:41:56Z	conversion	1	7	Instagram
339ioo0AhoFFi7kD33ohoEBii	2018-07-21T17:48:59Z	impression	0	0	Online Display
339ioo0AhoFFi7kD33ohoEBii	2018-07-29T09:47:51Z	impression	0	0	Paid Search
FE7fhinB977BnABBhiCkConkF	2018-07-10T12:32:35Z	impression	0	0	Paid Search
FE7fhinB977BnABBhiCkConkF	2018-07-10T12:32:44Z	impression	0	0	Paid Search

- **cookie:** unique identifier of user/session
- **timestamp**: the time of particular interaction with an add
- **conversion:** binary column containing information if particular visit ended in conversion or not
- **channel:** digital marketing campaign touch points (including Facebook, Instagram, Online Display, Online Video and Paid Search)

DATA OVERVIEW

Budget Dataset

day	channel	impressions	cost
7/1/2018	Facebook	7576	26.516
7/1/2018	Instagram	3350	13.4
7/1/2018	Online Display	3769	16.9605
7/1/2018	Online Video	2364	11.82
7/1/2018	Paid Search	4992	27.456
7/2/2018	Facebook	9482	56.892
7/2/2018	Instagram	4120	26.78
7/2/2018	Online Display	3724	13.034
7/2/2018	Online Video	3786	15.144
7/2/2018	Paid Search	8806	39.627
7/3/2018	Facebook	8447	42.235

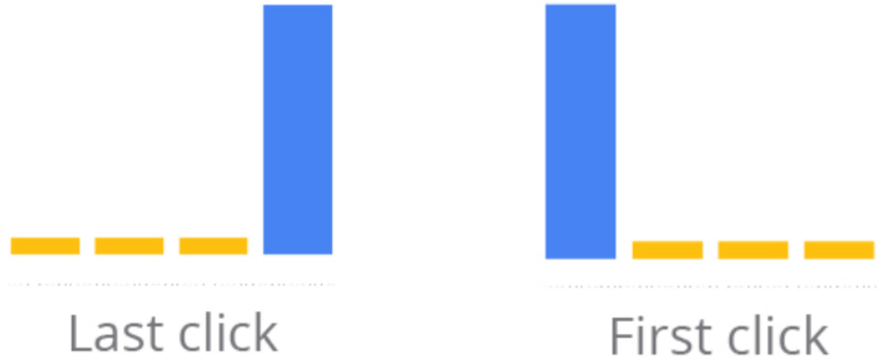
- Simulated daily cost values for whole campaign calculated as a function of number of impressions

Attribution Modeling

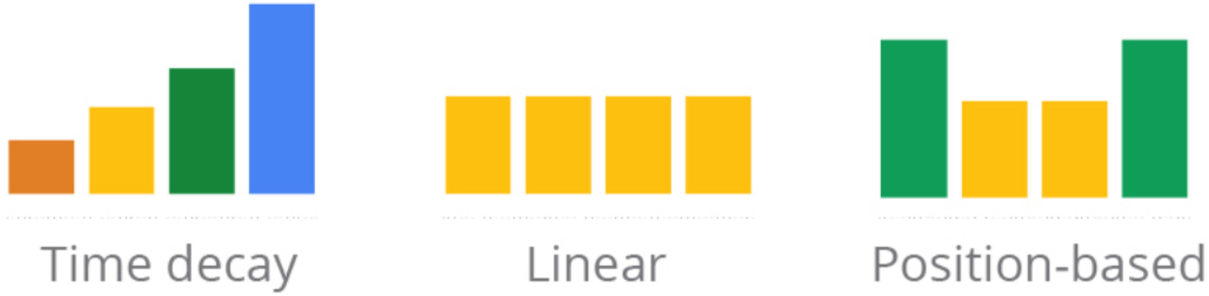
Attribute weights of importance to each digital marketing channel

DATA DRIVEN ATTRIBUTION MODEL

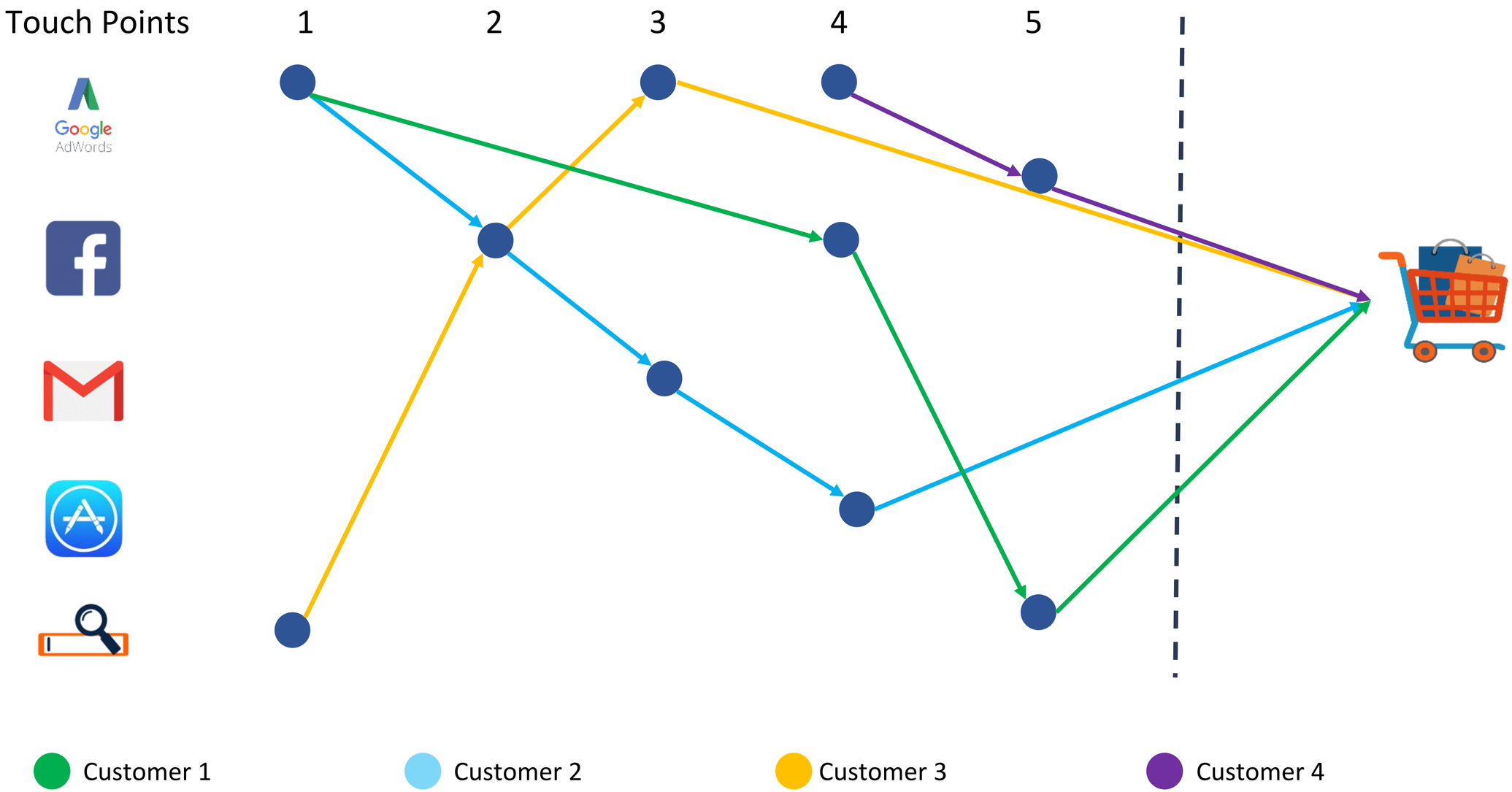
Single-Touch Model:



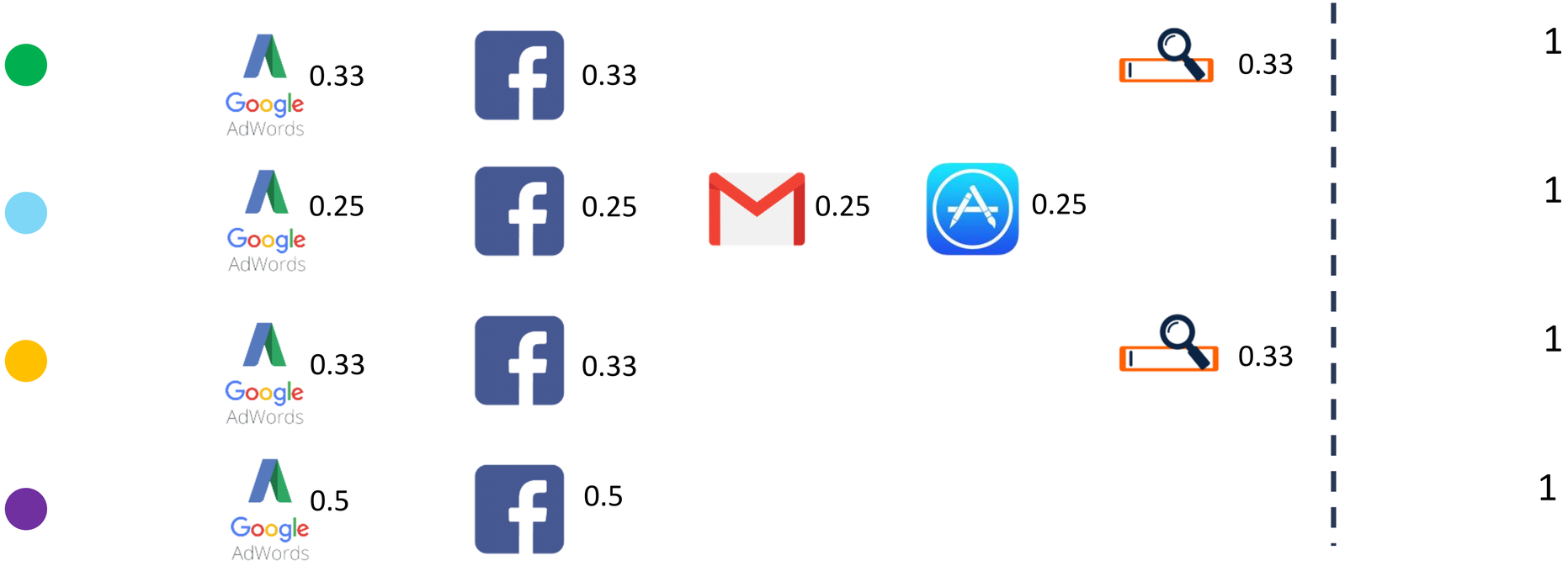
Multi-Touch Model:



CUSTOMER JOURNEY EXAMPLE



LINEAR ATTRIBUTION MODEL



(0.33+0.25+0.33+0.5)/4=35.3%

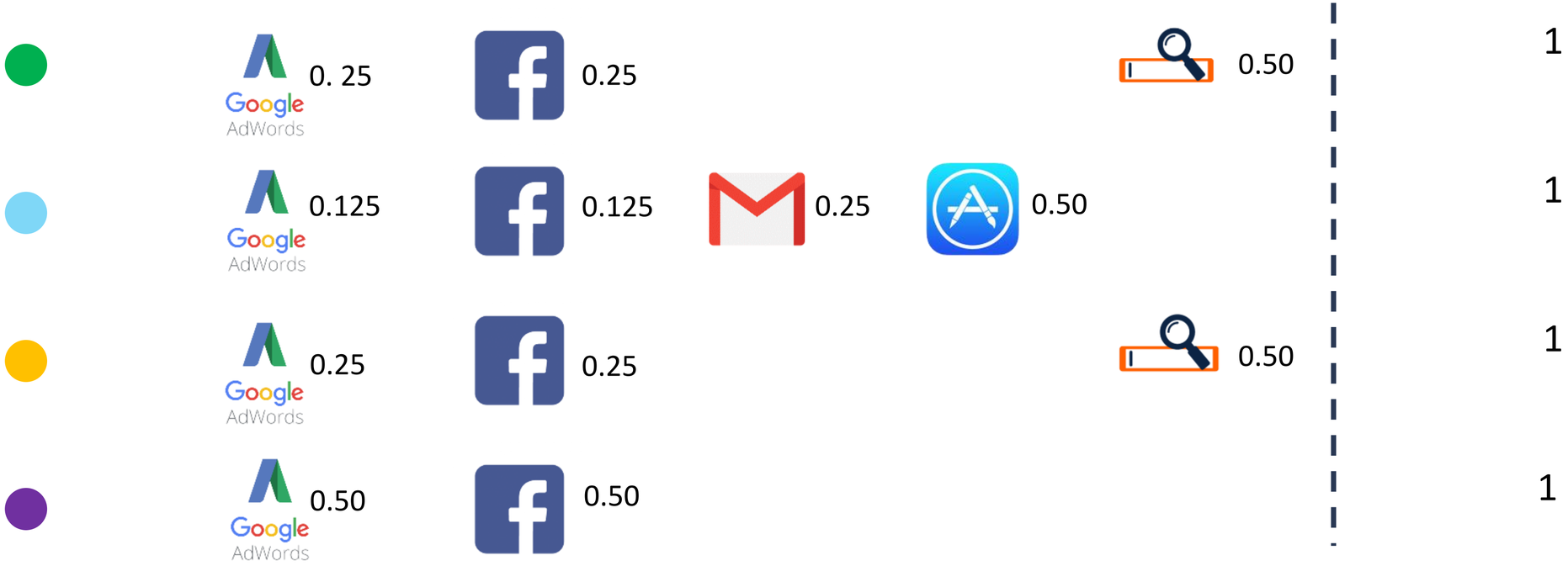
(0.33+0.25+0.33+0.5)/4=35.3%

0.25/4=6.35%

0.25/4=6.35%

(0.33+0.33)/4=16.5%

TIME DECAY ATTRIBUTION MODEL



(0.25+0.125+0.25+0.50)/4=28.1%

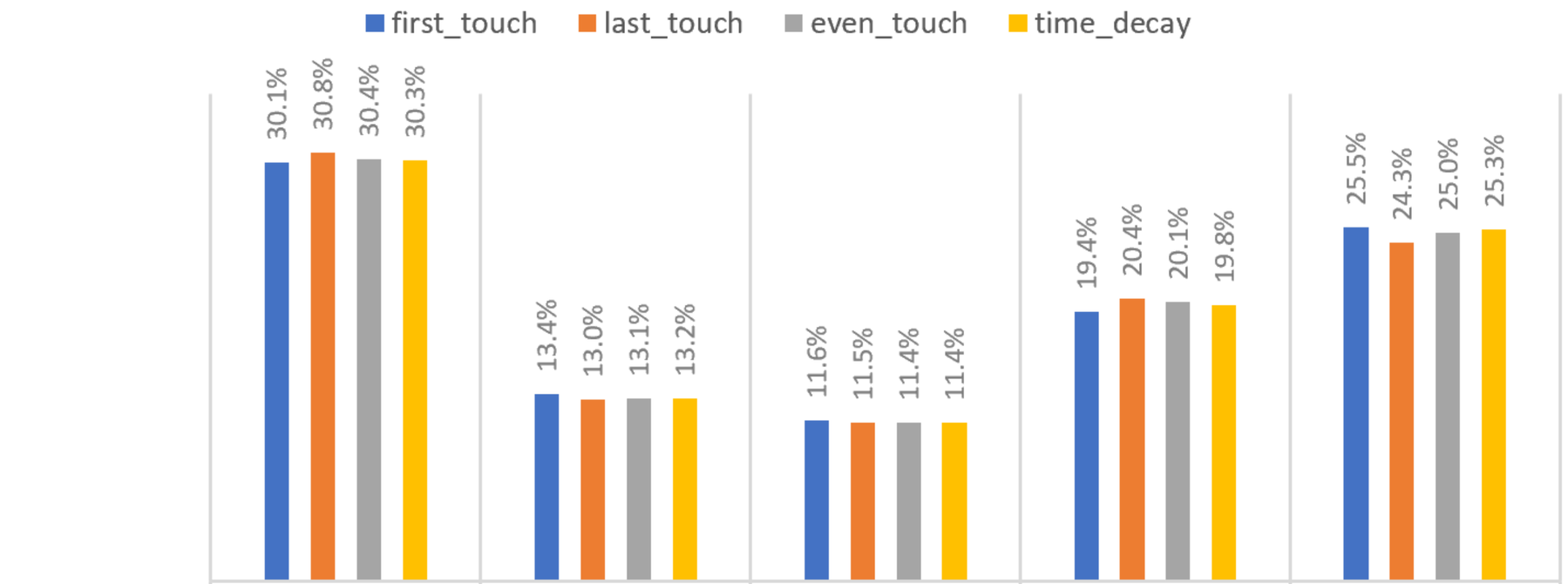
(0.25+0.125+0.25+0.50)/4=28.1%

0.25/4=6.25%

0.50/4=12.5%

(0.50+0.50)/4=25.0%

DATA DRIVEN ATTRIBUTION MODEL RESULTS

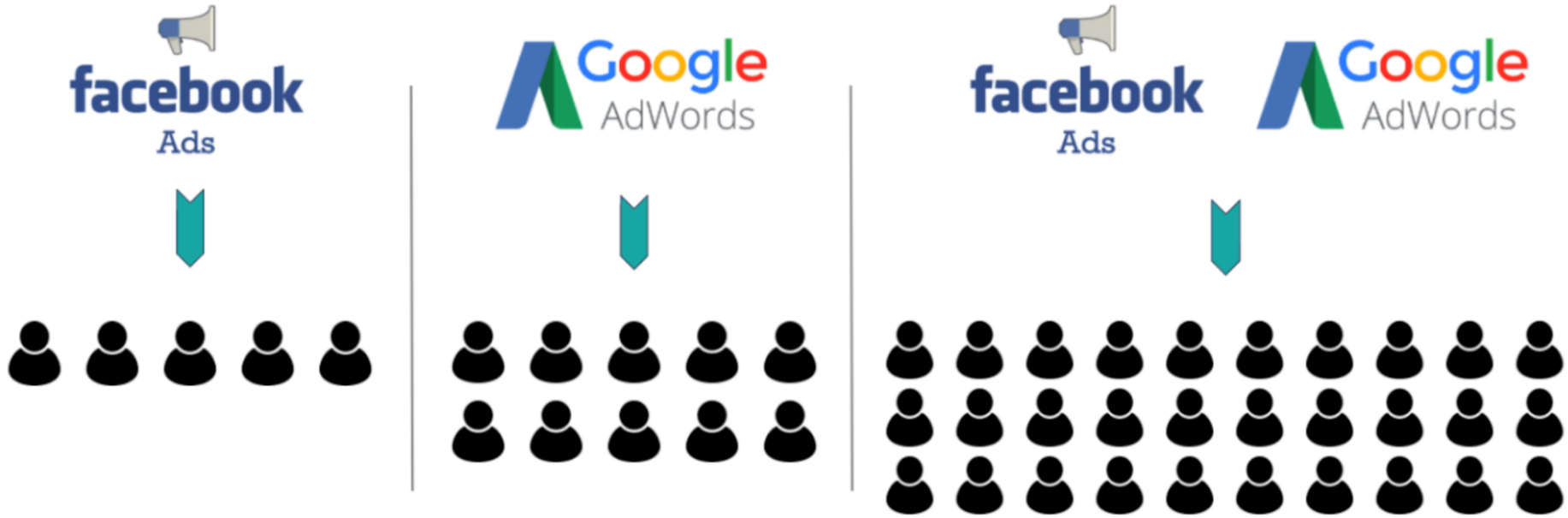


	Facebook	Instagram	Online Display	Online Video	Paid Search
first_touch	30.1%	13.4%	11.6%	19.4%	25.5%
last_touch	30.8%	13.0%	11.5%	20.4%	24.3%
even_touch	30.4%	13.1%	11.4%	20.1%	25.0%
time_decay	30.3%	13.2%	11.4%	19.8%	25.3%

SHARPLEY MODEL (GAME THEORY)

- Each marketing channel: a player in a cooperative game
- A set of channels (players) works together to drive conversions
- Finding each player’s marginal contribution

SHARPLEY MODEL EXAMPLE



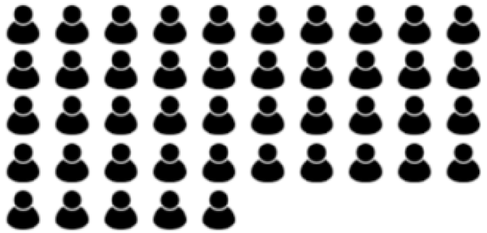
5 conversions

10 conversions

30 conversions

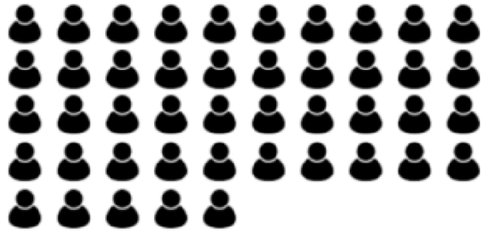
SHARPLEY MODEL EXAMPLE

On average, Facebook Ad leads to 20 conversions

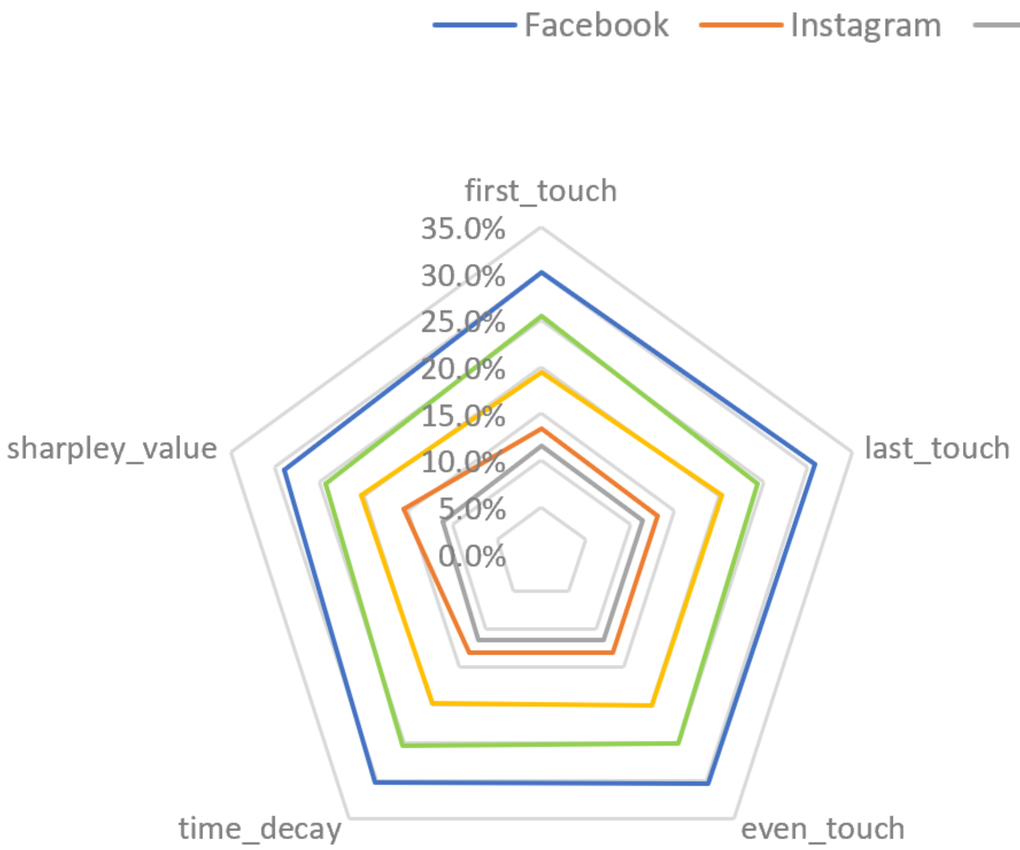
	v (S)	v (S U {Facebook})	v (S U {Facebook}) - v (S)
S = {Ø}	∅ 0 conversions	 5 conversions	Facebook Ad's marginal contribution to the empty coalition is : 5 conversions
S = {GoogleAd}	 10 conversions	 45 conversions	Facebook Ad's marginal contribution to the coalition containing Google Adwords: 35 conversions

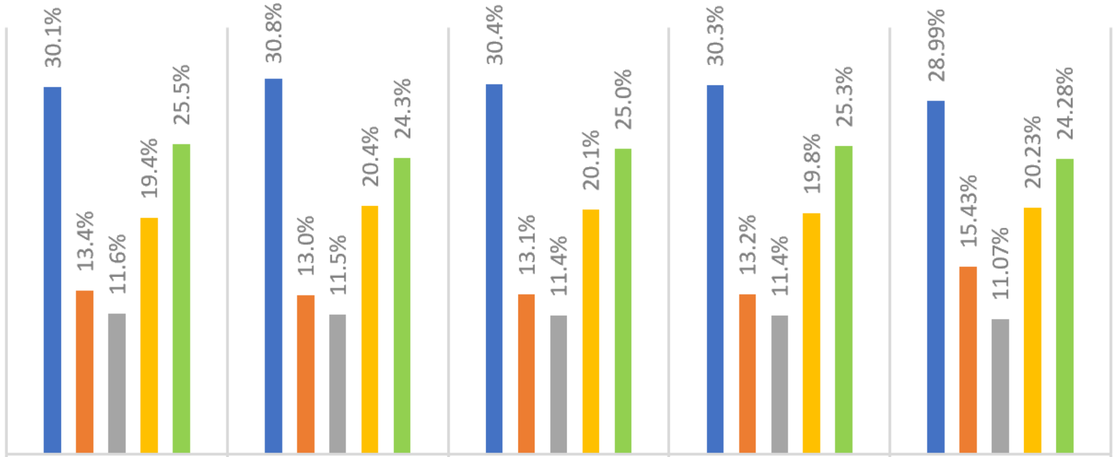
SHARPLEY MODEL EXAMPLE

On average, Google AdWords leads to 25 conversions

	v (S)	v (S U {GoogleAd})	v (S U {GoogleAd}) - v (S)
S = {Ø}	∅ 0 conversions	 10 conversions	GoogleAd's marginal contribution to the empty coalition is : 10 conversions
S = {Facebook}	 5 conversions	 45 conversions	GoogleAd's marginal contribution to the coalition containing Facebook Ads: 40 conversions

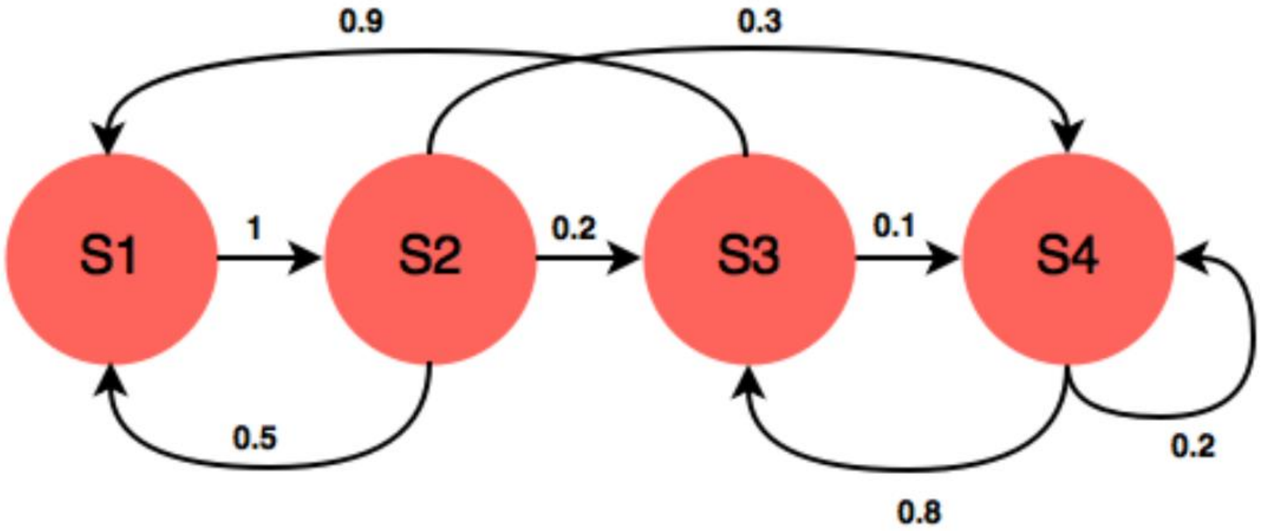
MODEL COMPARISON





	first_touch	last_touch	even_touch	time_decay	sharpley_value
Facebook	30.1%	30.8%	30.4%	30.3%	28.99%
Instagram	13.4%	13.0%	13.1%	13.2%	15.43%
Online Display	11.6%	11.5%	11.4%	11.4%	11.07%
Online Video	19.4%	20.4%	20.1%	19.8%	20.23%
Paid Search	25.5%	24.3%	25.0%	25.3%	24.28%

MARKOV CHAIN MODEL



- translate series of events into **set of states** and **transition probabilities** between them
- Each touchpoint represents the state with the conversion or no-conversion being the final outcome of the journey

MARKOV CHAIN MODEL EXAMPLE

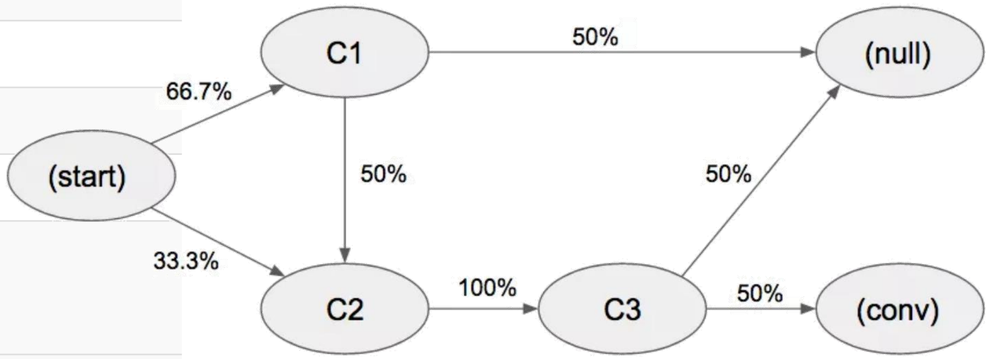
Assume we have three customer journeys:

- C1 -> C2 -> C3 -> purchase
- C1 -> unsuccessful conversion
- C2 -> C3 -> unsuccessful conversion

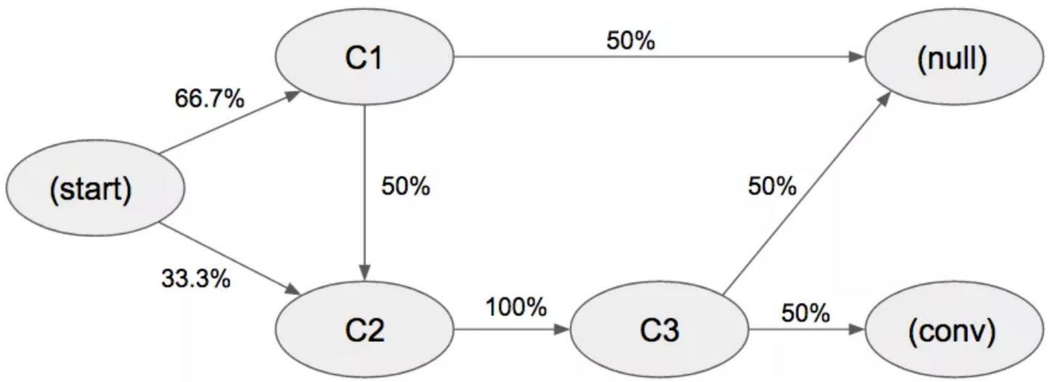
1 - Customer journey	2 - Transformation	3 - Splitting for pairs
C1 -> C2 -> C3 -> purchase	(start) -> C1 -> C2 -> C3 -> (conversion)	(start) -> C1, C1 -> C2, C2 -> C3, C3 -> (conversion)
C1	(start) -> C1 -> (null)	(start) -> C1, C1 -> (null)
C2 -> C3	(start) -> C2 -> C3 -> (null)	(start) -> C2, C2 -> C3, C3 -> (null)

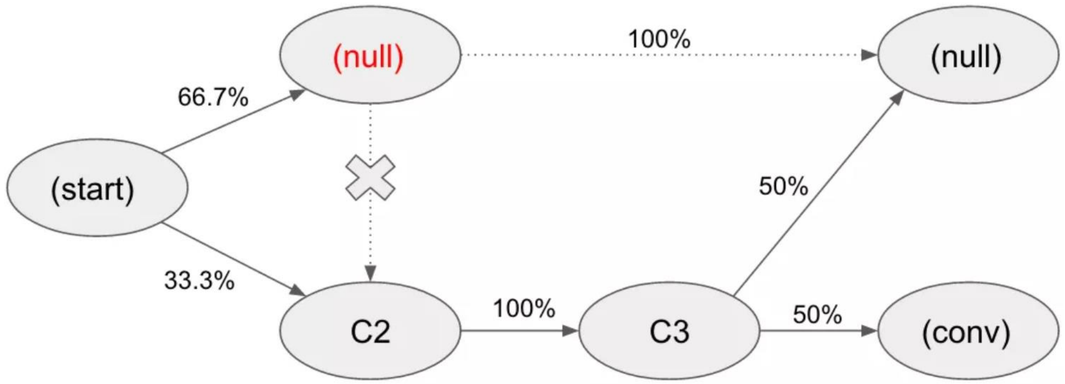
MARKOV CHAIN MODEL EXAMPLE

from	to	probability	total probability
(start)	C1	1/3	66.7%
(start)	C1	1/3	
(start)	C2	1/3	33.3%
total from (start)		3/3	
C1	C2	1/2	50%
C1	(null)	1/2	50%
total from C1		2/2	
C2	C3	1/2	100%
C2	C3	1/2	
total from C2		2/2	
C3	(conversion)	1/2	50%
C3	(null)	1/2	50%
total from C3		2/2	



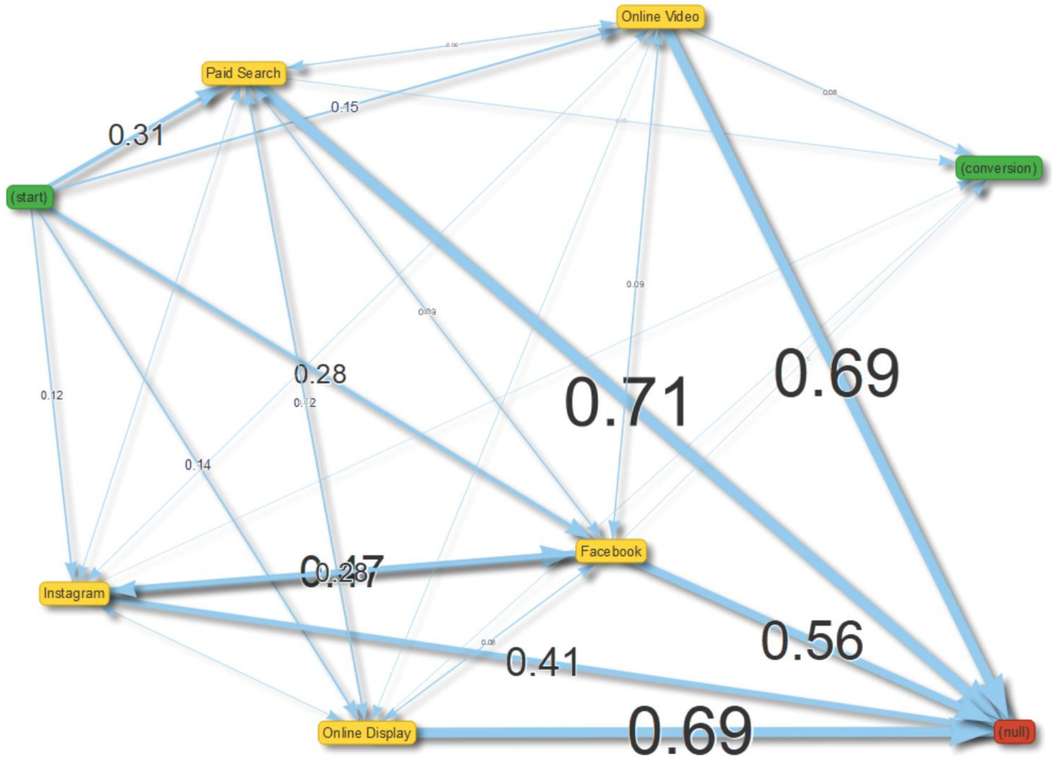
MARKOV CHAIN MODEL: REMOVAL EFFECT

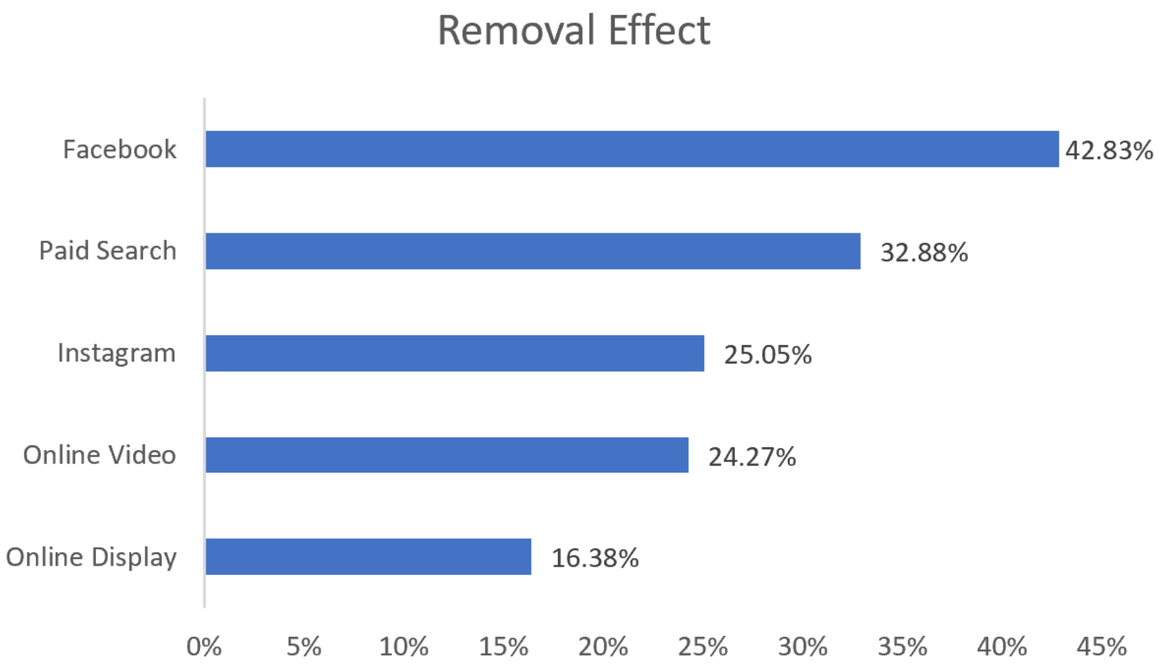




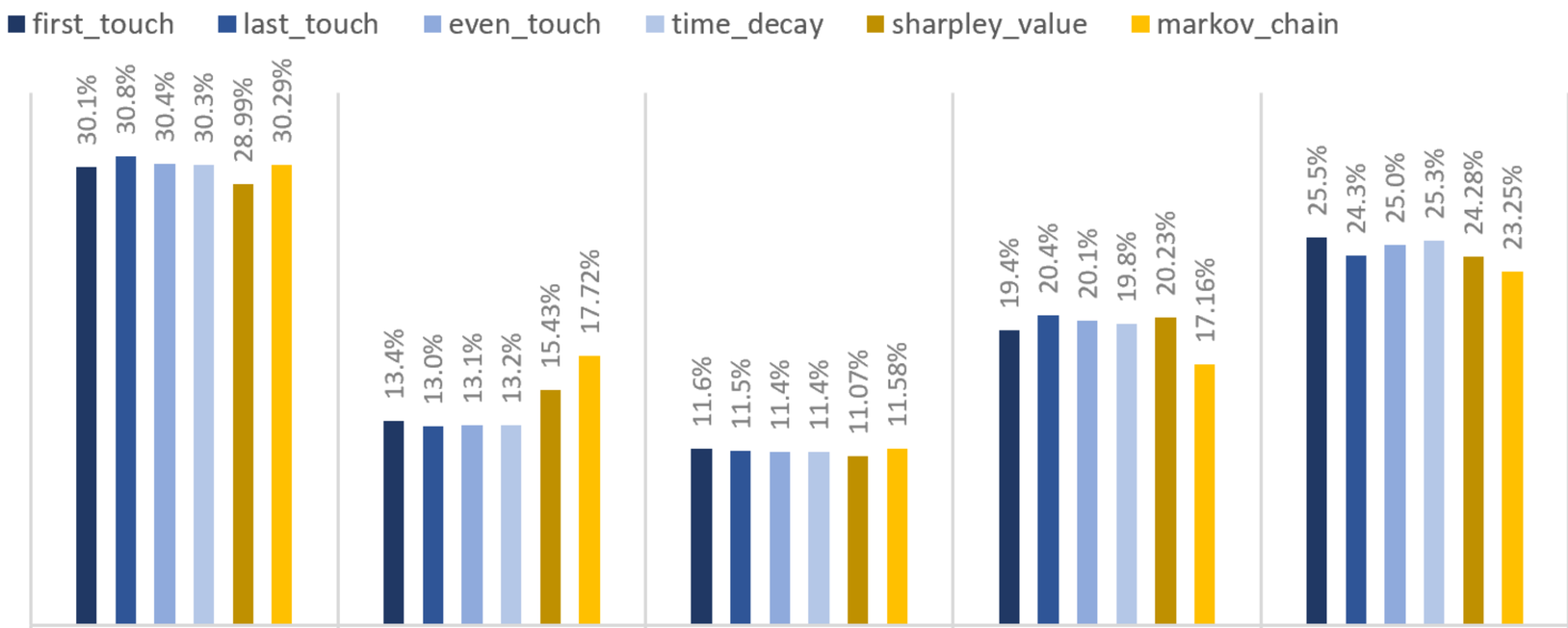
- The probability of conversion = 0.667 * 0.5 * 1 * 0.5 + 0.333 * 1 * 0.5 = 33.3%
- After removing C1, the probability of conversion = 0.333 * 1 * 0.5 = 16.7%
- The channel C1 removal effect is (1-0.167/0.333) = 0.5
- Removing C1, we will lose 50% of conversions

MARKOV CHAIN MODEL RESULTS





MODEL COMPARISON



	Facebook	Instagram	Online Display	Online Video	Paid Search
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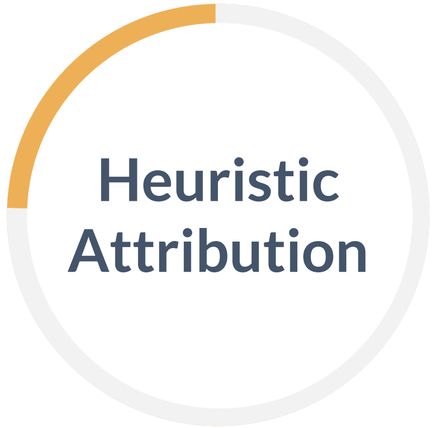
last_touch	30.8%	13.0%	11.5%	20.4%	24.3%
even_touch	30.4%	13.1%	11.4%	20.1%	25.0%
time_decay	30.3%	13.2%	11.4%	19.8%	25.3%
sharpley_value	28.99%	15.43%	11.07%	20.23%	24.28%
markov_chain	30.29%	17.72%	11.58%	17.16%	23.25%

MODEL COMPARISON



Model 1:

Assigning weights based on expertise / experience

Model 2:

Fairness in assigning weights

Marginal value

Model 3:

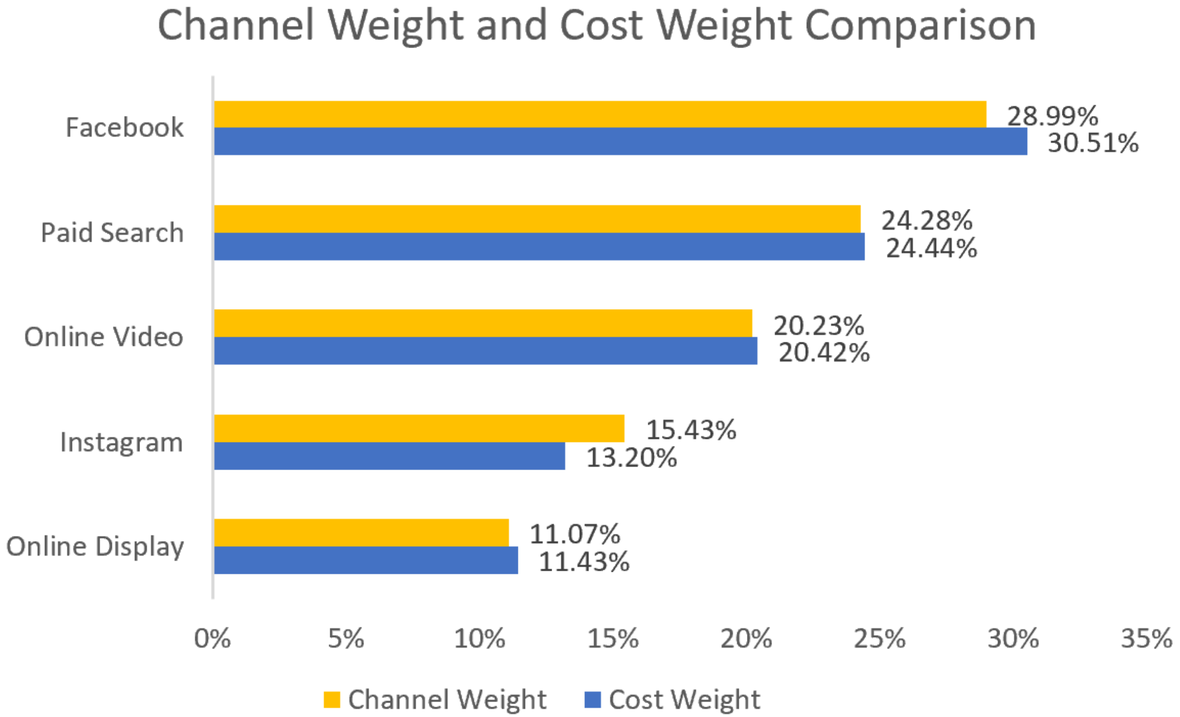
Visualize customer journey

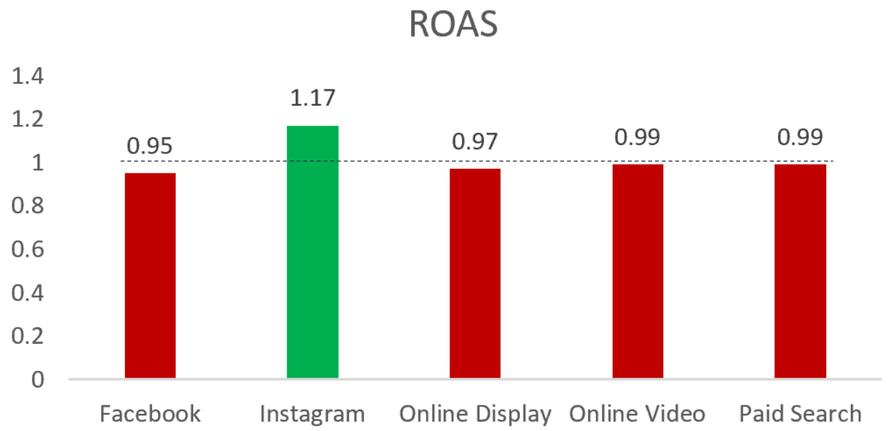
Removal effects indicates importance of existing channels

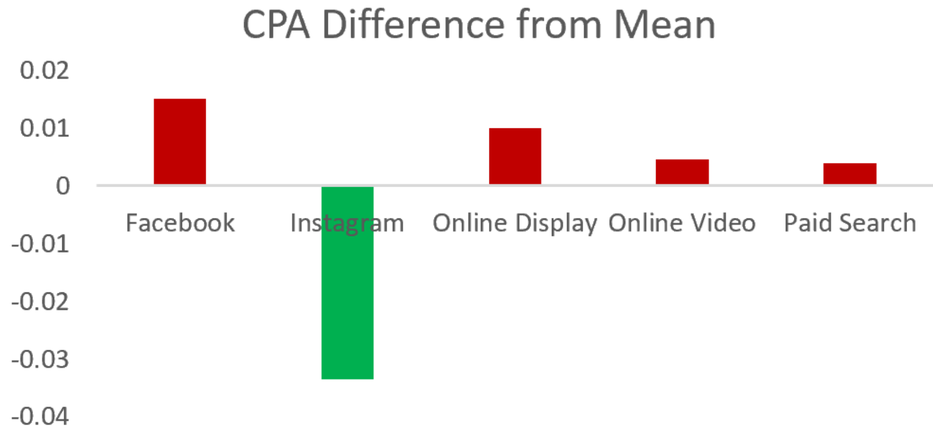
Economic Analysis

Analyze channel efficiency and effectiveness

ECONOMIC ANALYSIS





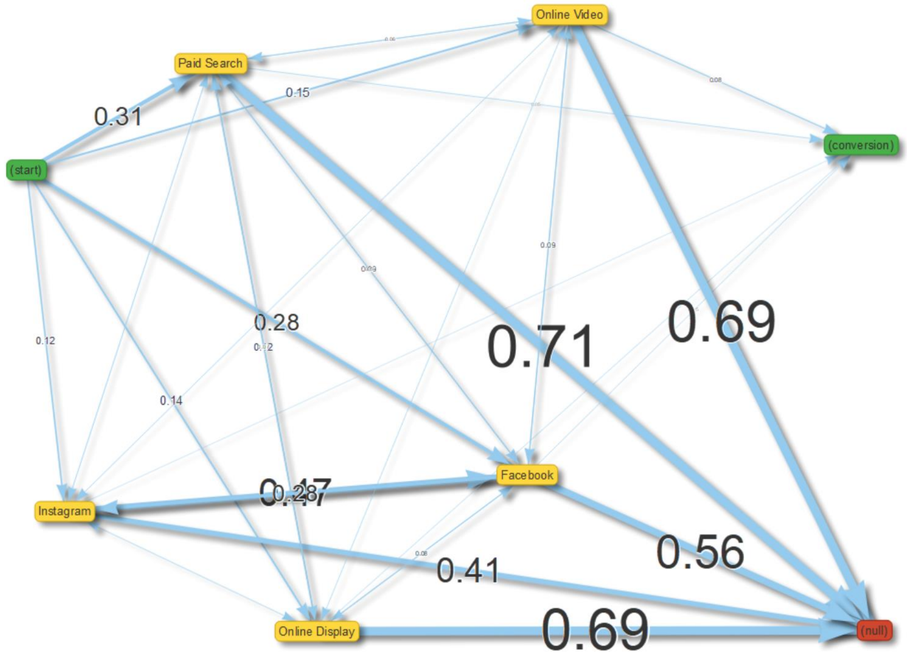


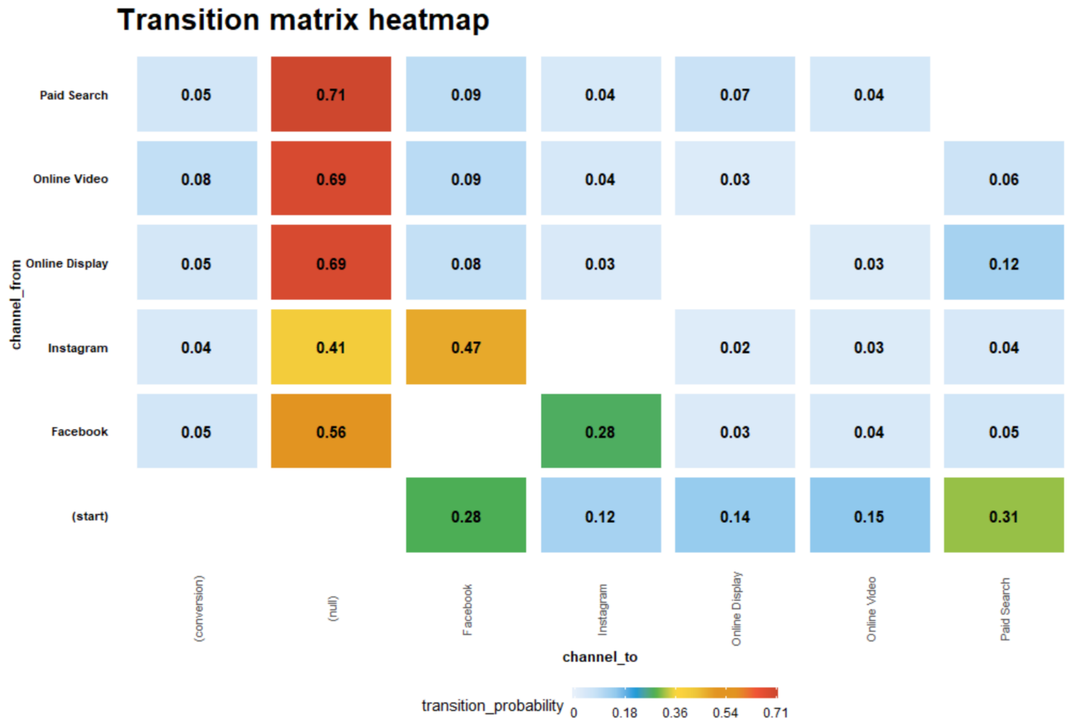
- *ROAS (Return On Ad Spend) = channel attribution / channel cost*
- *CPA (Cost Per Action) = channel cost / channel conversion*

Customer Journey Analysis

Explore customer journey of digital marketing interactions leading to point of sale

TRANSITION MATRIX

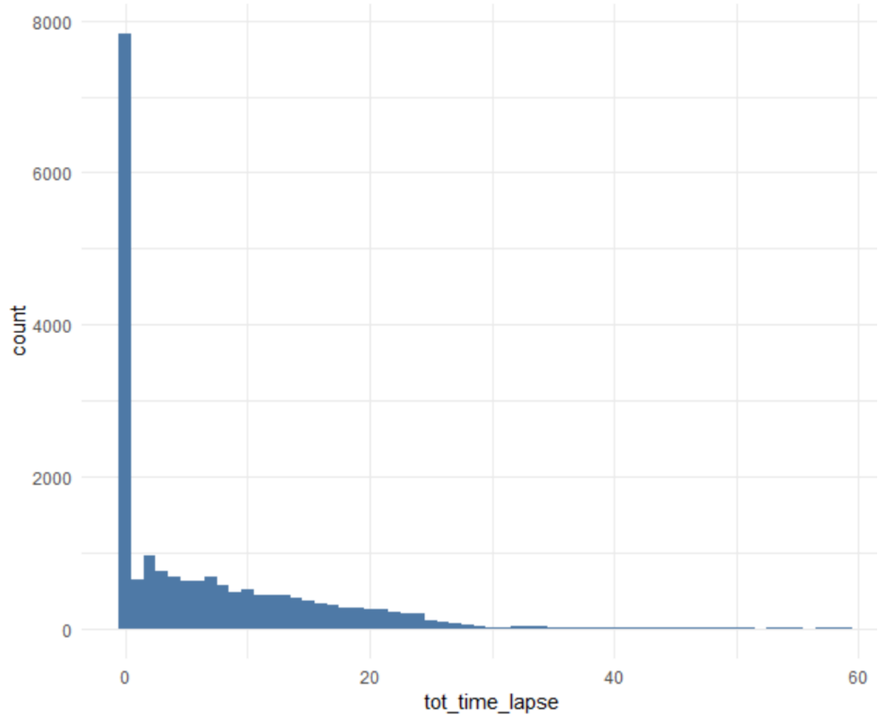




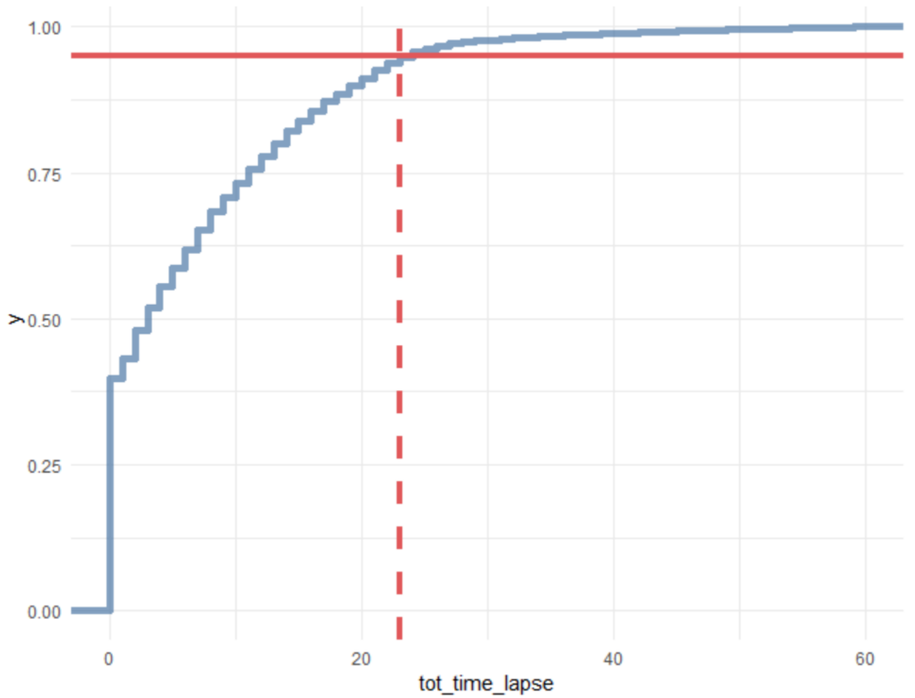
- Customers are more likely to start with Paid Search and Facebook
- Online Video is more likely to lead to conversion
- Facebook and Instagram are less likely to lead to NULL

CUSTOMER JOURNEY DURATION

Customer Journey Duration Distribution



Customer Journey Duration Cumulative Distribution



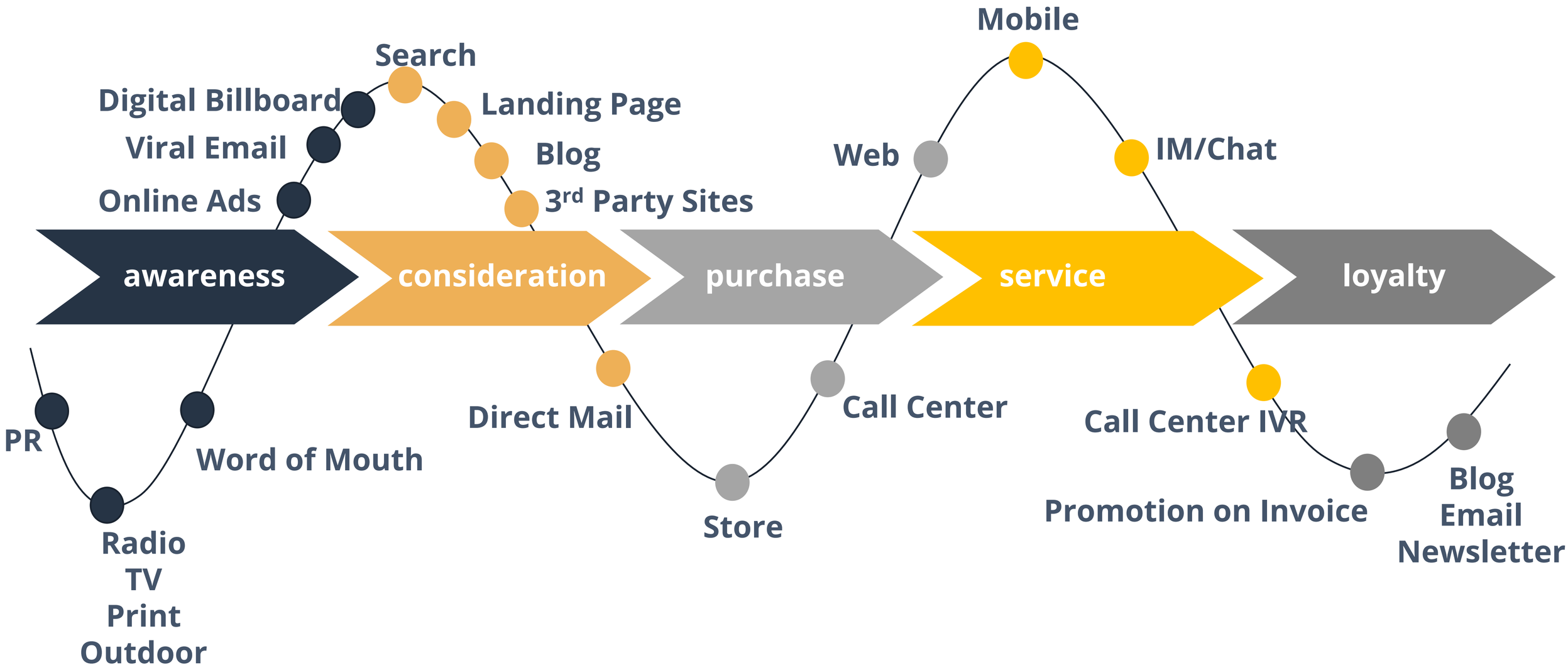
- 22 days period covers 95% of paths

INDIVIDUAL CUSTOMER JOURNEY DURATION

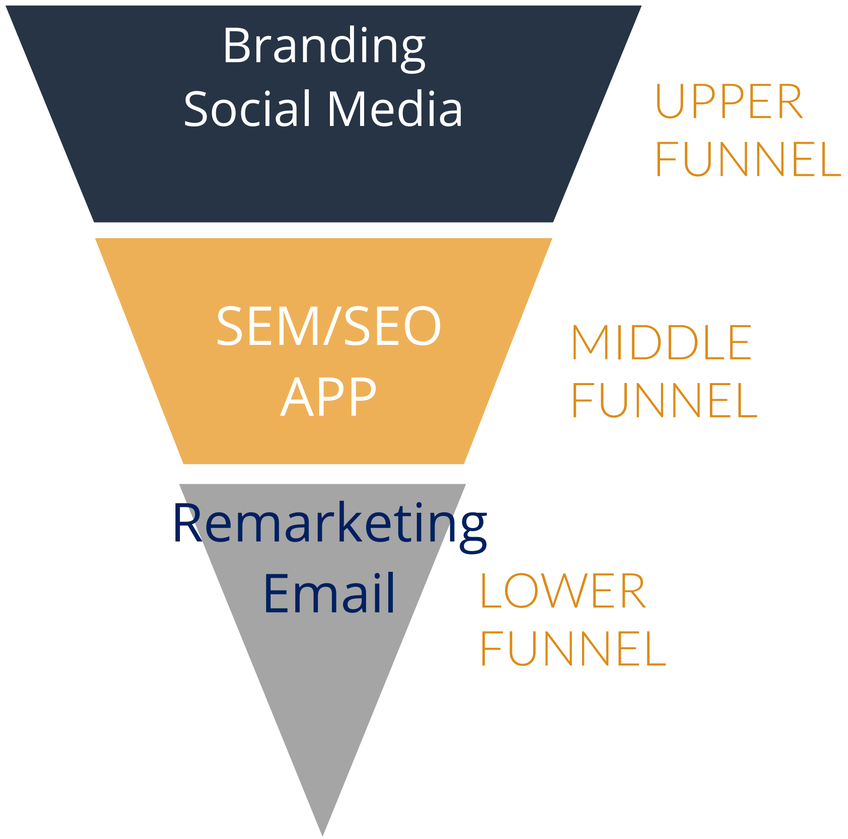
- Within certain time window, some customers finished the path while others did not
- Identify which paths are completed as of reporting date both in a conversion or not

Conclusion

DIGITAL TOUCHPOINTS



KEY TAKEAWAYS



- Multiple ways to build attribution model
- Economic analysis on ROAS and CPA could further lead to budget optimization
- Customer journey analysis improves attribution model and sheds insights on marketing strategies
- Combing customer segment analysis, full funnel analysis and attribution model would indicate marketing channel mix strategies


Q & A