



BIKE SHARING ANALYSIS

Should our city adopt a bicycle
rideshare program?

INTRODUCTION/BUSINESS PROBLEM

Mythical town board **WANTS** advice on the feasibility of establishing a bicycle ride sharing program

How does an existing program operate in another city of similar size, and what lessons might be learned

Specific information was requested on the following questions:

Is ridership widespread or concentrated in certain areas?

Are most trips within a small radius or far-ranging?

Are there any interesting demographic keys associated with ridership?

For how long do riders rent their bikes?

How prevalent is bike theft in the city?





Bike Share Toronto Answers Your Questions

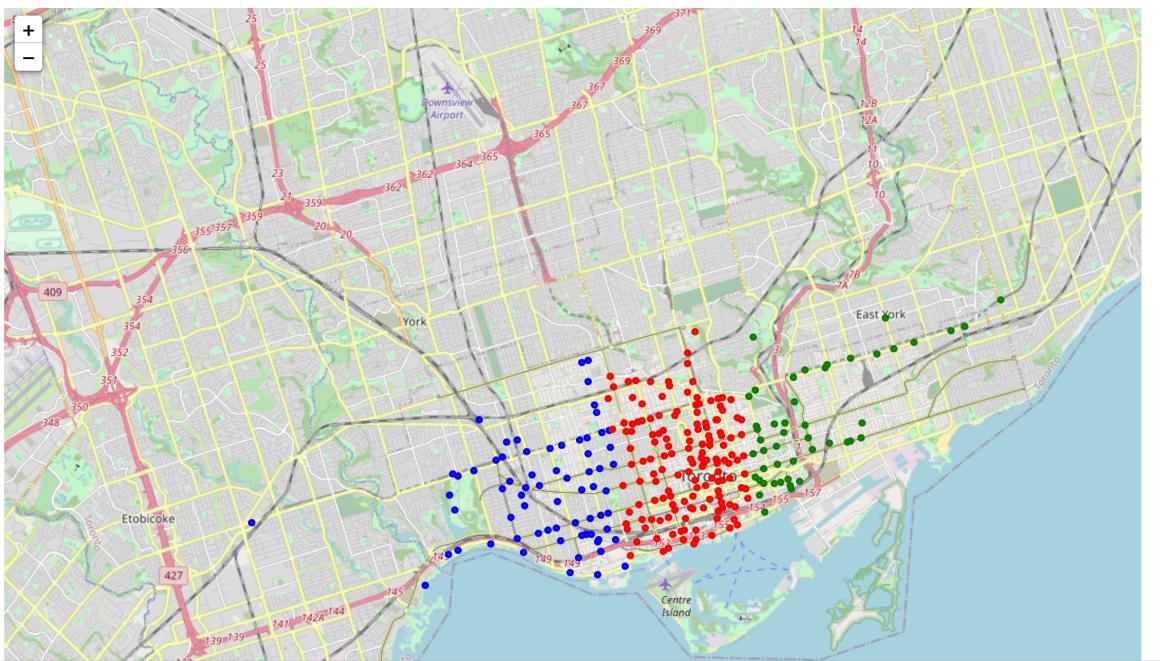
DATA USED FOR ANALYSIS

Four primary sources were used for this analysis;

- 2018 Bike Rideshare Information on over 1.7 million trips from Open Data Toronto
- Demographic information on population, income and education from WellBeing Toronto
- Geocode information on 270 BikeShare Toronto station locations acquired through the Google Maps API
- Crime statistics acquired through Toronto Police Service



QUESTION 1: Is ridership widespread or concentrated in certain areas?



K-MEANS ANALYSIS TO DETERMINE BIKE STATION CLUSTERS –

With over 1.7 million trips and 270 stations things could get unwieldy. Clustering helped break things into more manageable chunks.

- Cluster 0 MIDDLE
- Cluster 1 LEFT
- Cluster 2 RIGHT

For reference, cluster 0 is red and the downtown area



CLUSTER AND INTER-CLUSTER TRIPS

to_cluster_label	from_cluster_label	
0	0	1022538
	1	153748
	2	102139
1	0	157826
	1	103604
	2	13515
2	0	105774
	1	14380
	2	43512

- Over 1.3 million trips in 2018 took place within a single cluster out of a total of 1.7+ million total trips.
- Downtown trips were far and away the most taken.

Question 2: Are most trips within a small radius or far-ranging?

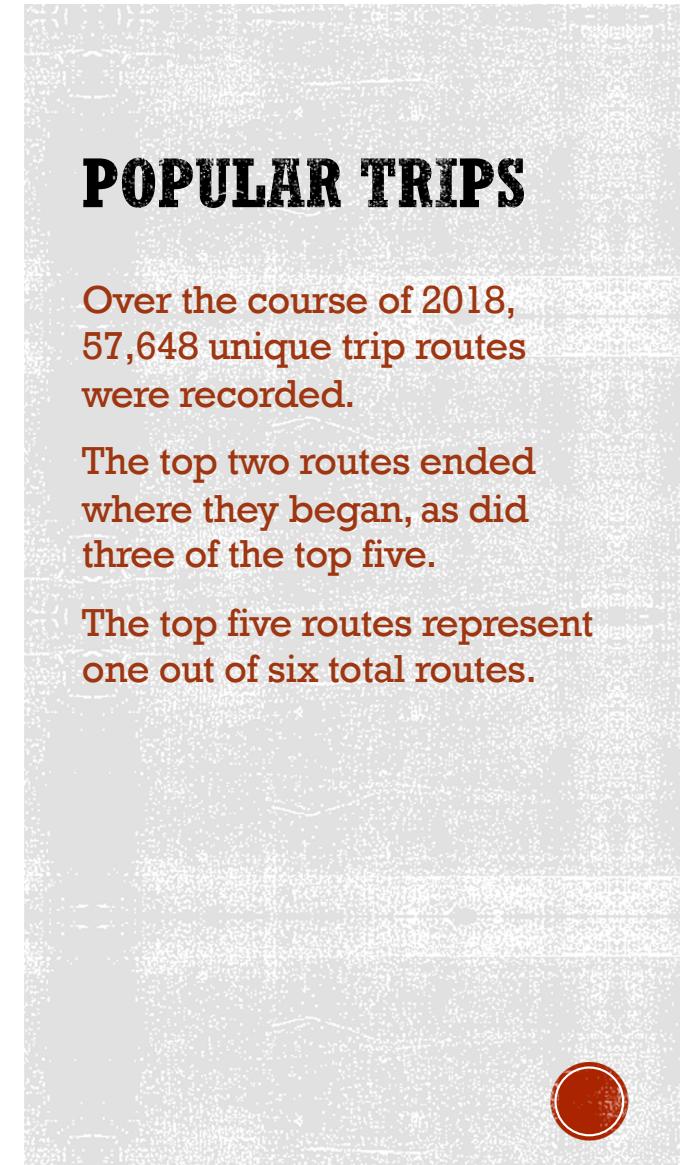
from_station_name	to_station_name	
Bay St / Queens Quay W (Ferry Terminal)	Bay St / Queens Quay W (Ferry Terminal)	3697
Humber Bay Shores Park West	Humber Bay Shores Park West	2232
Bathurst St/Queens Quay(Billy Bishop Airport)	York St / Queens Quay W	2034
Front St W / Blue Jays Way	Union Station	1997
York St / Queens Quay W	York St / Queens Quay W	1997
	...	
Mortimer Ave / Coxwell Ave	King St W / Spadina Ave	1
King St E / Jarvis St	Kendal Ave / Spadina Rd	1
Wright / Sorauren (Sorauren Park) – SMART	Queen St E / Sackville St	1
Mortimer Ave / Coxwell Ave	King St E / Jarvis St	1
John St / Mercer St – SMART	Parliament St / Bloor St E	1
Length: 57648, dtype: int64		

POPULAR TRIPS

Over the course of 2018, 57,648 unique trip routes were recorded.

The top two routes ended where they began, as did three of the top five.

The top five routes represent one out of six total routes.



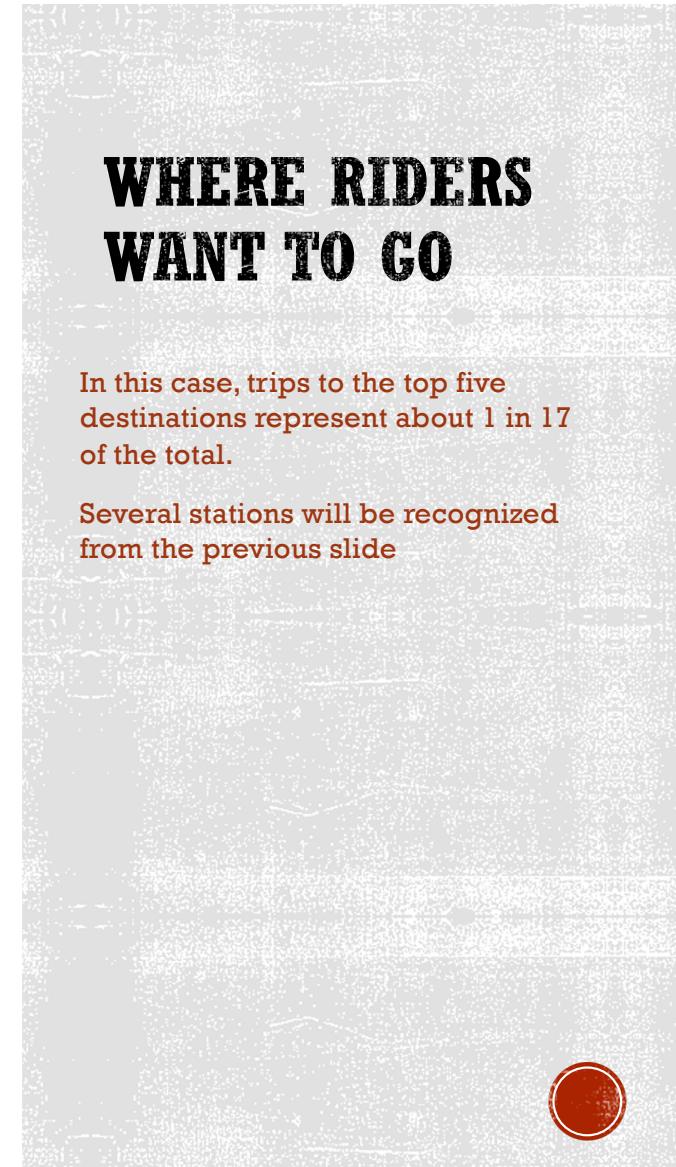
Five Most Popular Destinations

to_station_name	Popular Destinations	Trip Length	Minutes
York St / Queens Quay W	25060	1514.277534	25.237959
Union Station	24843	767.342752	12.789046
Bay St / Queens Quay W (Ferry Terminal)	23733	2787.766359	46.462773
Princess St / Adelaide St E	18942	721.300443	12.021674
Dundas St W / Yonge St	18267	827.349318	13.789155

WHERE RIDERS WANT TO GO

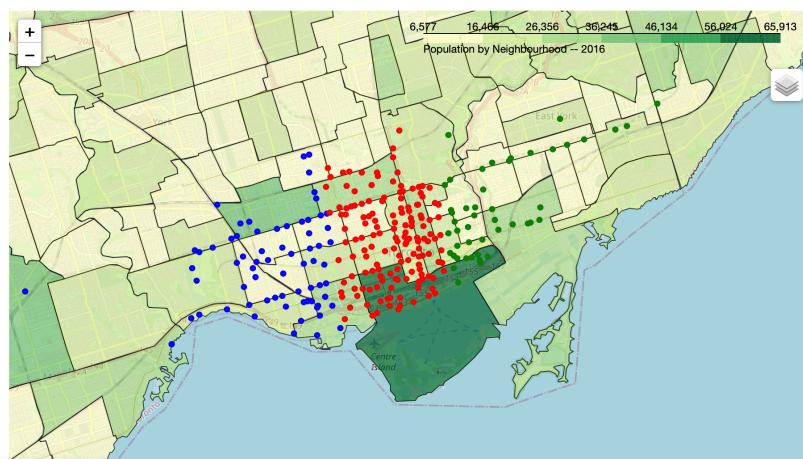
In this case, trips to the top five destinations represent about 1 in 17 of the total.

Several stations will be recognized from the previous slide

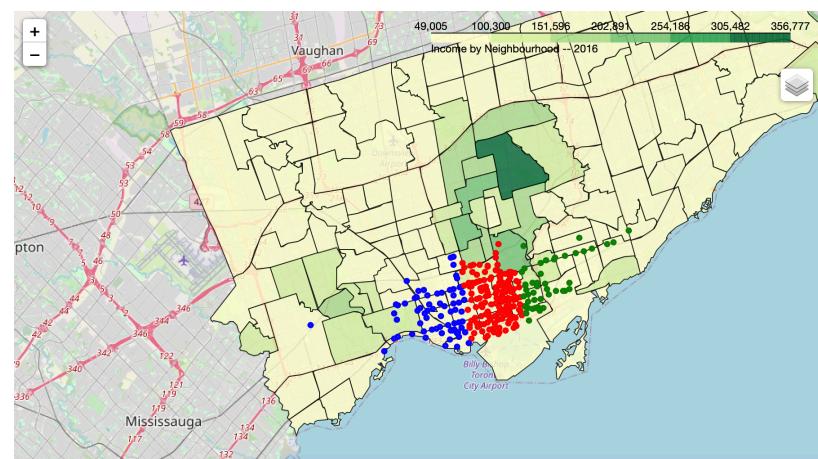


QUESTION 3: ARE THERE ANY INTERESTING DEMOGRAPHIC KEYS ASSOCIATED WITH RIDERSHIP?

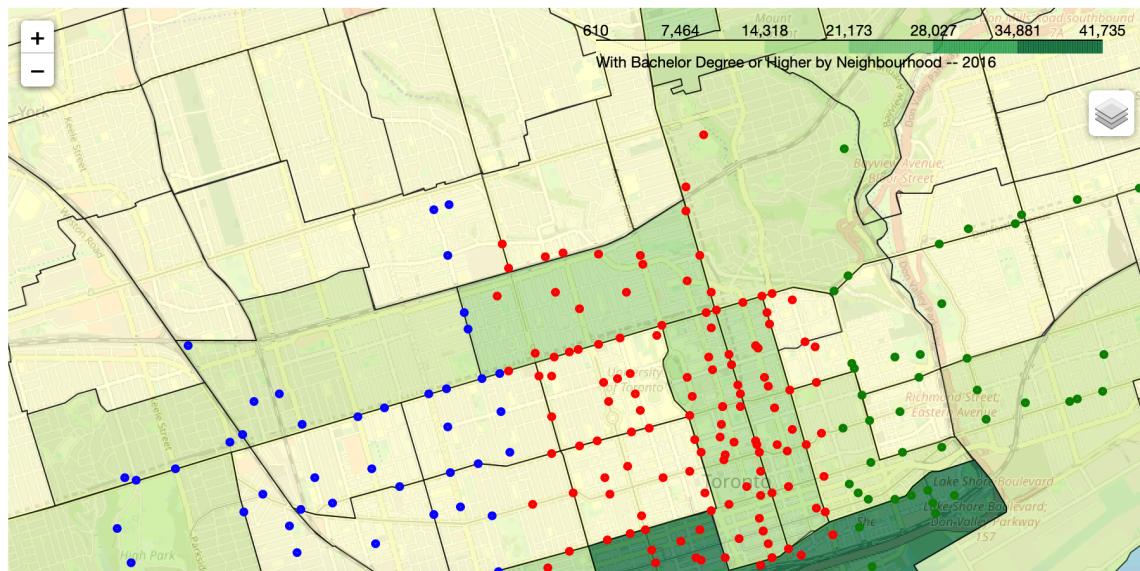
CHOROPLETH OF NEIGHBOURHOODS BY POPULATION



CHOROPLETH OF NEIGHBOURHOODS BY AVERAGE INCOME



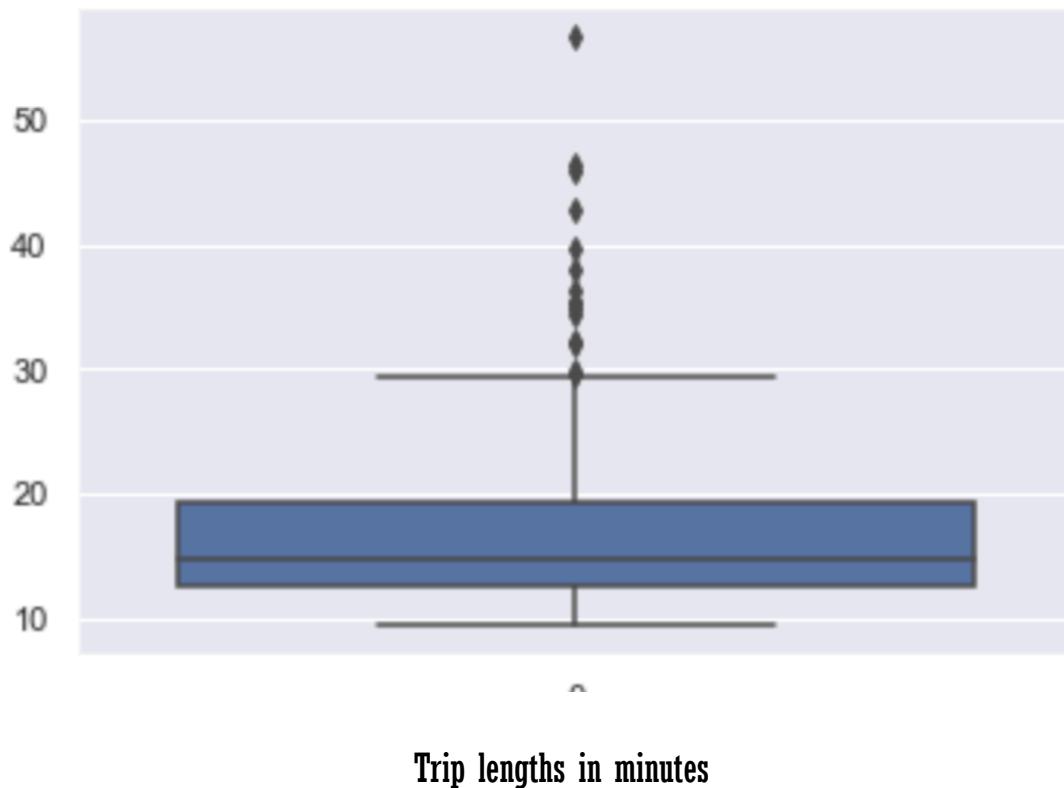
Choropleth Of College Graduates By Neighbourhood



KEY DEMOGRAPHIC FINDINGS

- There are higher concentrations of population and college graduates around union station
- Higher income neighbourhoods mainly trend north of bike station locations
- None of these findings are of particular note to inform the decision-making process

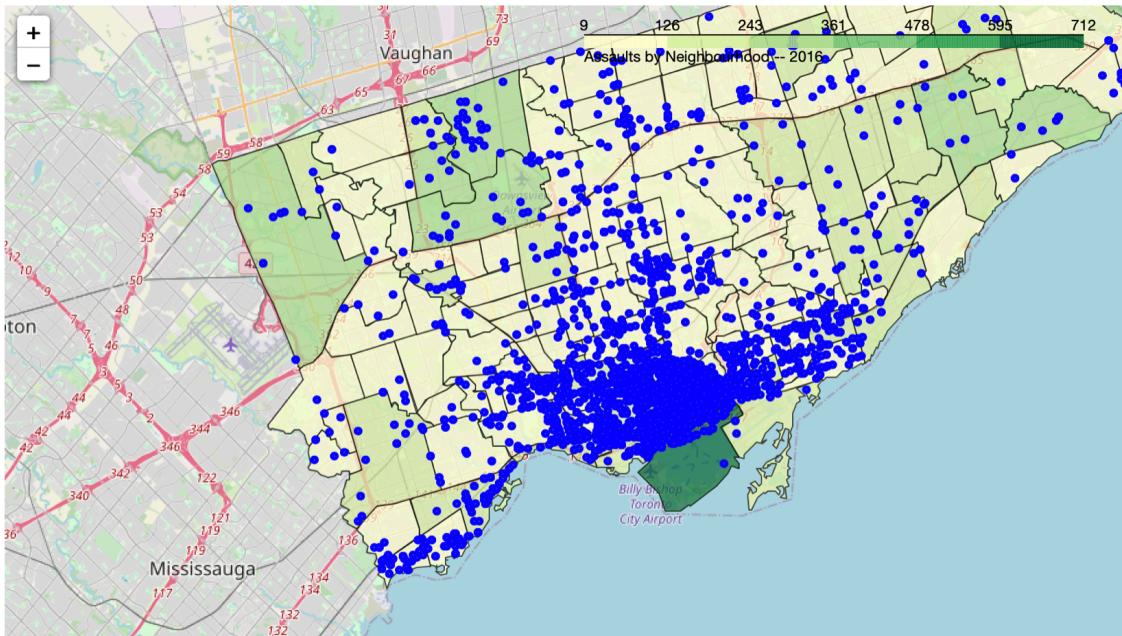
Question 4: For how long do riders rent their bikes?



RENTAL LENGTH AT A GLANCE

- According to the Bike Share FAQ: "Bike share was created for quick trips and getting from Point A to Point B. Rides are limited to 30 minutes to ensure bike availability for all riders to "share." This encourages riders to use bike share for quick trips and return the bike to any station within 30 minutes."
- It appears that 75% of all rides comply with this goal, and almost all trips are under 50 minutes.

Question 5 - How prevalent is bike theft in the city?



THEFT AND ASSAULT

- This map is an overlay of bike thefts over a neighbourhood assault choropleth.
- Bike theft is yet another variable that shows a greater concentration in the more highly populated downtown area.
- Assaults are also higher in that area

Rider

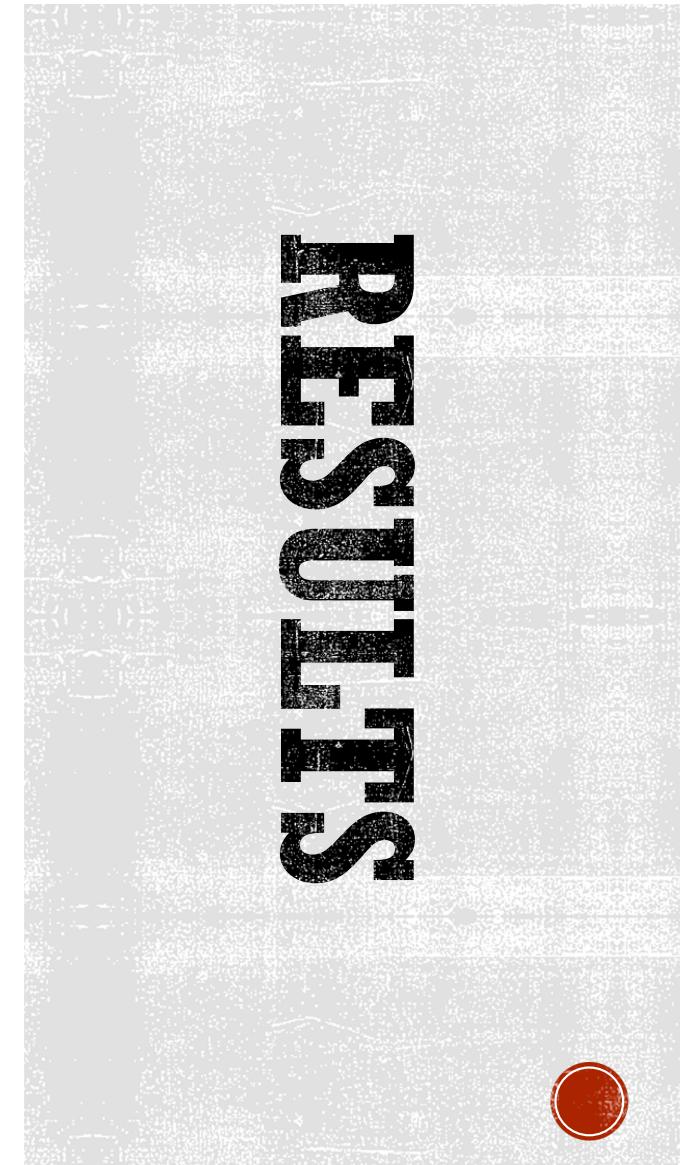
- Annual Pass Holder
- A little better educated

Trip

- Stays in the zone
- Rides for 20 minutes

Arrival

- Connects to other transportation
- Aware of surroundings



DISCUSSION

Data

- Data was there to answer the questions asked
- Were they the right questions?
- What additional data analysis might be useful?

Policy

- Defined policy goals
- Program design
- Costs v. Benefits
- Who manages

Intangibles

- Will neighbourhoods welcome bike stations
- Is there a nuisance factor potential



Feasibility

- Identify subsidy sources
- Environment v. Expenditure

Accessibility

- High Density Areas to Start
- Right Place, Right Time

Desirability

- Public perception
- Rider motivation

Conclusions

