



IMPACT OF NAVIGATION APPS ON TRAVEL BEHAVIOUR IN DELHI

Ede Sowmya

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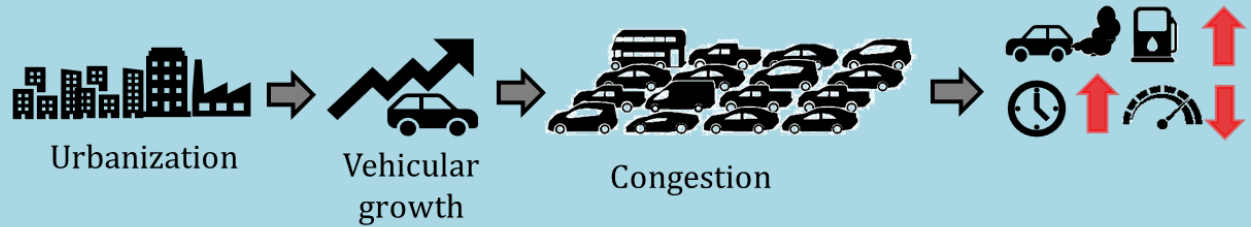
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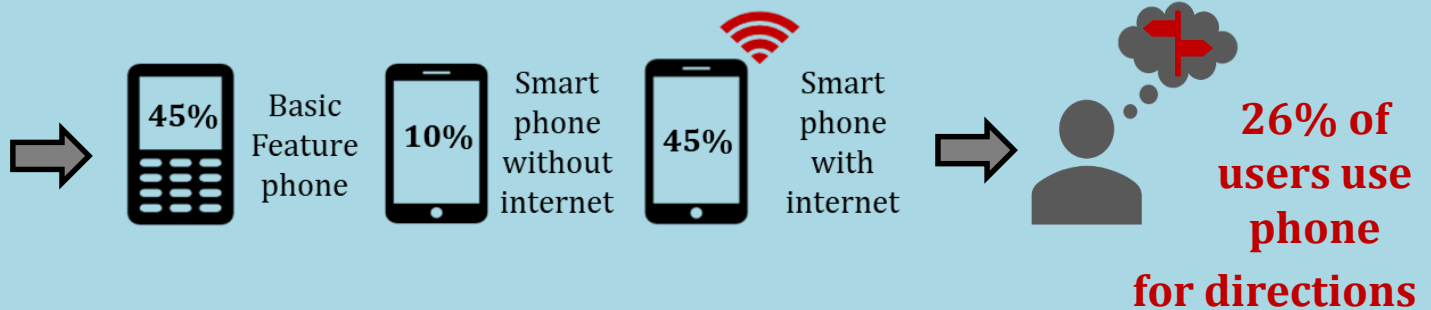
INTRODUCTION

In the past few decades, rapid urbanisation is seen



So, People are depending on Technology and Large data base which is present online

At present the Mobile internet users- **49% of total population**



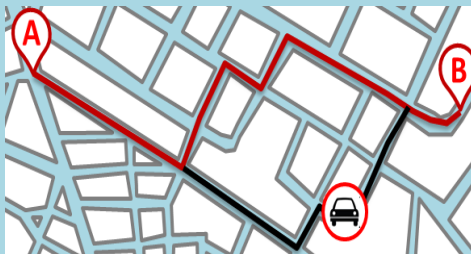
Source: Digital In 2017: Global Overview

Source: SaveLIFE Foundation Distracted Driving In India -2017

Why Do People Use Navigation Apps ?????



How Is It Impacting Travel Behaviour ?????



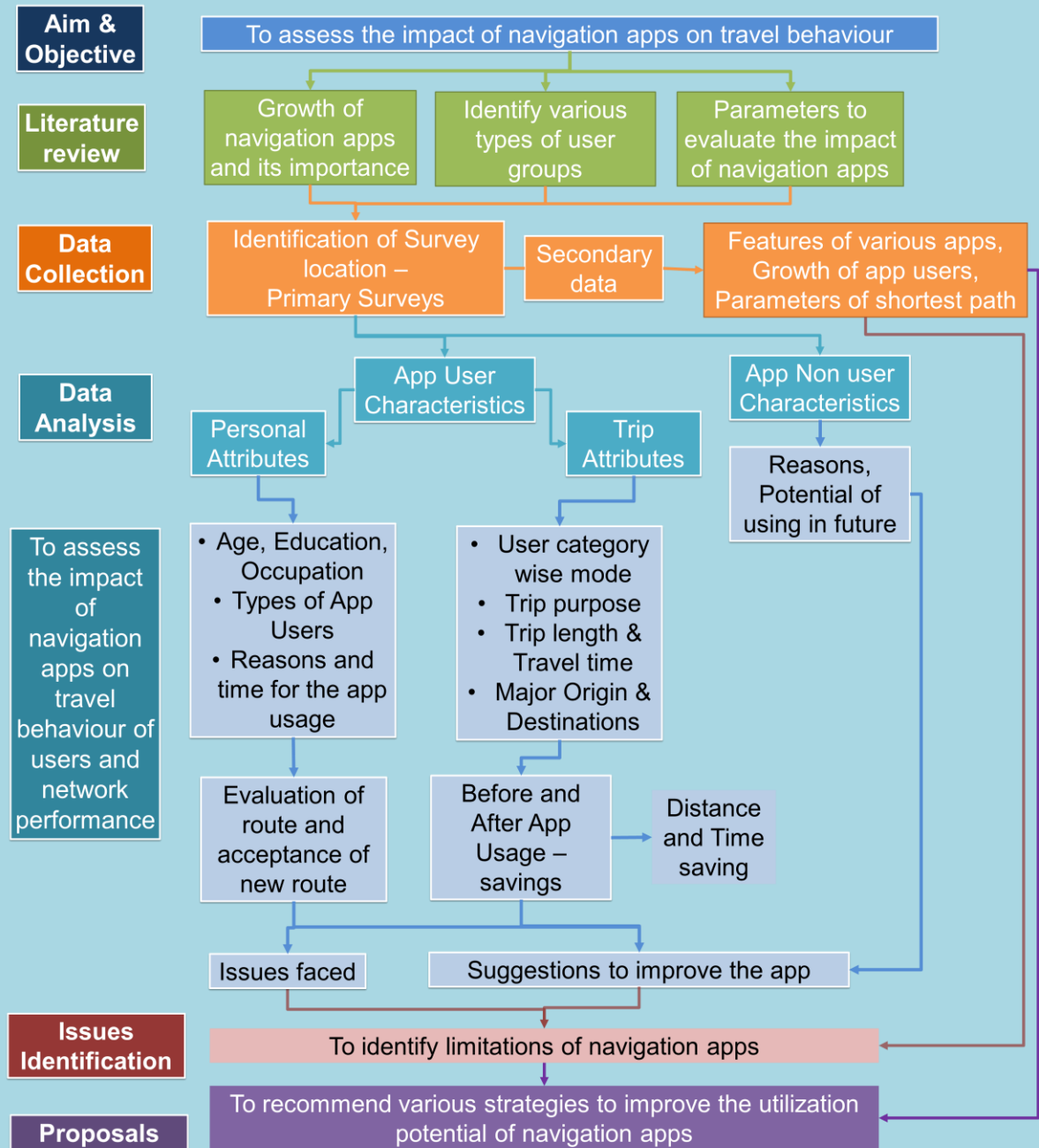
Based on the **ETA** shown by navigation maps people started **diverting** to other routes

METHODOLOGY

Why This Study Is Important ????

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Limited studies have been undertaken at global level and virtually insignificant no significant studies at national level

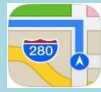


Literature Review

Types Of Navigation Apps



Google maps



Apple maps



Waze maps



Yahoo maps



Sygic maps



Tomtom Maps



Maps.me



Here Maps



Mapquest

Google Maps is the leader by far, with a 72% share of monthly unique visitors.

Source: eMarketer, 2018

Comparison Of Various Navigation Apps

App Name	Alternate routes	Real time Traffic Info	Alternate Modes	Location identification and information	Route Preference	Diversions/ Road works	Alerts – info, speed remainder	Information input by user	Display options - Colour	Offline maps
Google Maps	✓	✓	✓	✓	✗	✓	✗	✗	✗	✓
Waze	✓	✓	✗	✓	✓	✓	✓	✓	✗	✗
Apple Maps	✓	✓	✗	✓	✗	✗	✗	✗	✗	✗
Maps.me	✗	✗	✓	✓	✗	✗	✗	✗	✗	✗
Navmii	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
Sygic	✓	✗	✗	✓	✓	✓	✓	✗	✓	✓

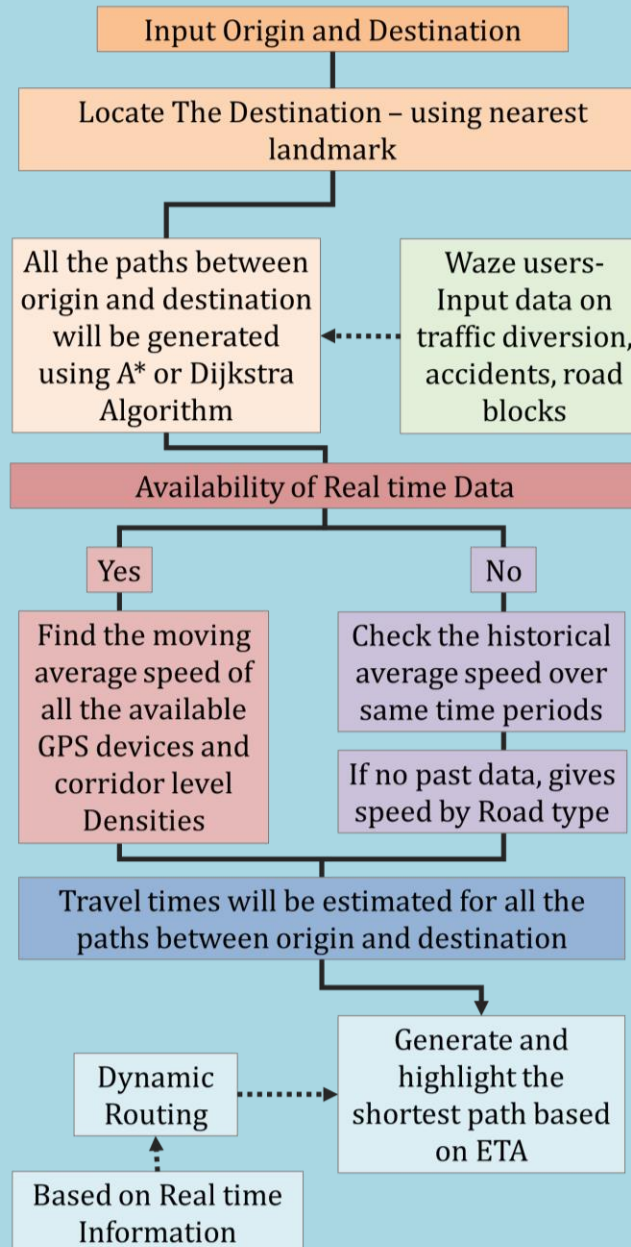
Literature Review

HOW GOOGLE MAPS WORKS ?????

ETA - official speed limits and recommended speeds, (speeds derived from road types, historical average speed, actual travel times from previous users, and real-time traffic information.

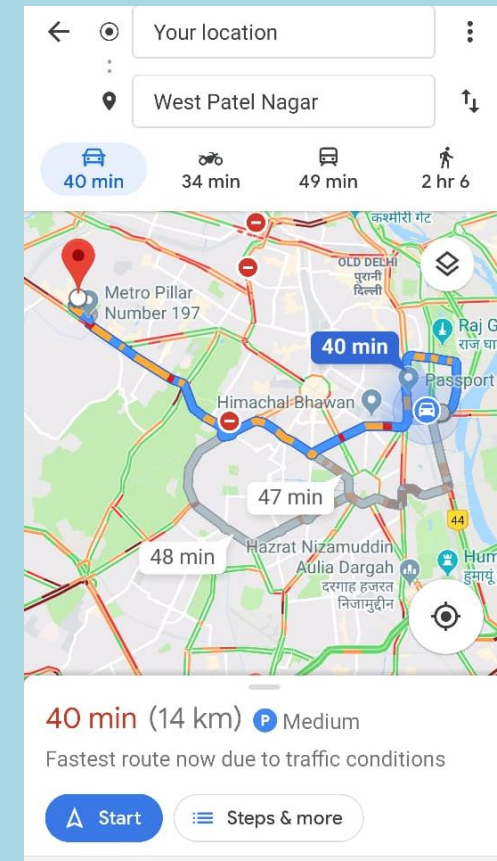
Google maps uses crowdsourced traffic data technique for collecting live traffic conditions data

Source: Dave Barth, product manager for Google Maps, Ex-Google Engineer Richard Russell



Example

Screenshot of Google Maps –
ITO – West Patel Nagar
– Routes by various modes

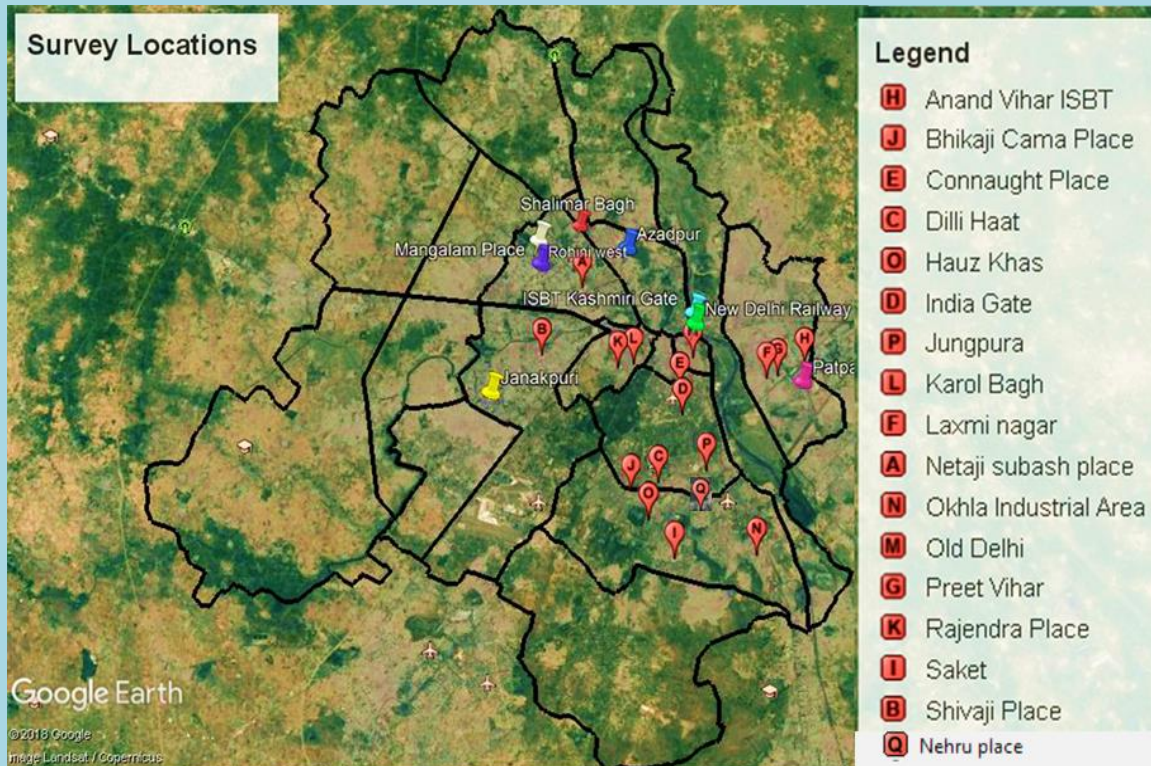


DATA BASE

DELHI is selected as a case study

- Total population of Delhi as per census **2011** is **1,67,87,941**
- % of people having mobile phone – **68%**

Total 240 samples collected across 17 survey locations



Information collected from Primary Surveys

Personal Information

Gender , Age , Education ,
Occupation ,Income

Availability of Smart Phone

App related Information

App user or not

Reasons for using the App

Frequency of using the app

Time of the day

Before and after using the app
changes observed

User category

Benefits & Issues

Trip Information

Trip purpose and Length

Mode & Origin and Destination

Route before and after
using the app

Travel time taken & Delay

User Characteristics

Personal Characteristics

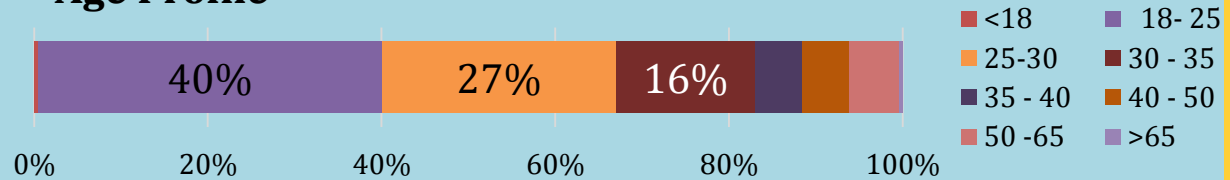


Male -
75%



Female -
25%

Age Profile



Navigation App
Users - **79%**



Google maps -
98.9%



**PEAK
HOUR**

App usage is more - **8 am -10 am**
and **4 pm -8 pm**

- **Navigation App usage** is related to Age of the user, Education, Income



App
usage ↓



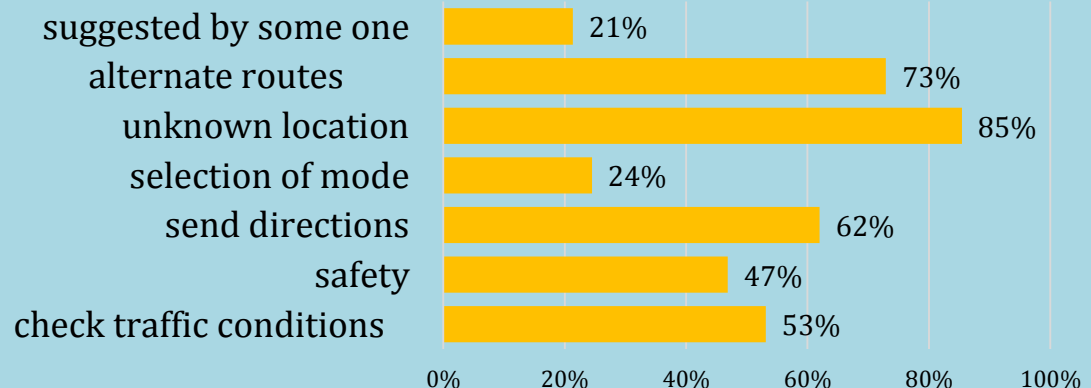
App
usage ↑



App
usage ↑

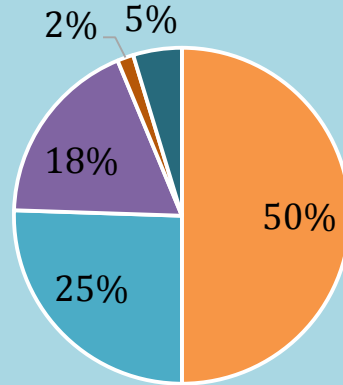
- **80-90% of users know basic features** of the app
- About 35% of navigation app users use it at least once a week while 25% of them use the app daily.

Reasons to use



Navigation App User Categories

User Category

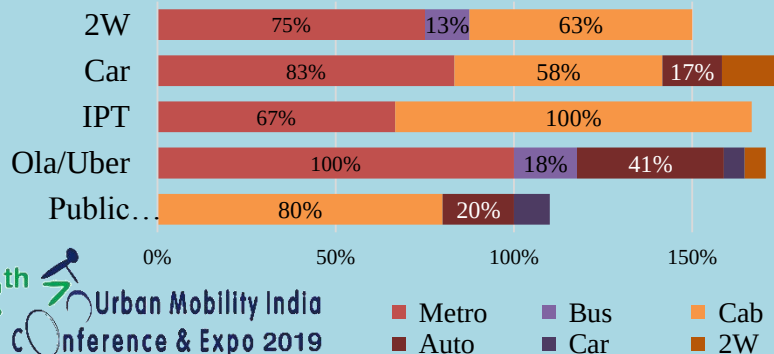


- Before the beginning
- throughout the trip
- In between the trip
- Before beginning and Throughout the trip
- Before beginning and In between the trip

Category 1 - Before the beginning of the trip

- 47% of users - **mode choice** is being affected by ETA shown by app
- Willingness to shift to another mode – 10% or 20% of time savings

Present mode wise – alternate choice



Category 2 - Though out the trip

- 36% of users** use the app while **self driving** and 26% when travelling by Cab
- 79%** - Observed **Change in Route** Dynamically and 93% of them divert to new route.
- 85% users use the app by seeing it.



- 2%** increase in minor accidents
- 5% in sudden jerks after using Apps

Navigation App User Categories

Category 3 - In between the trip

- 36% of the users use the app near **intersection or junctions** & 38% check when they reach any **landmark**
- 70%** - Observed **Change in Route** Dynamically and 80% of them divert to new route.

Characteristics of Non-Navigation app user

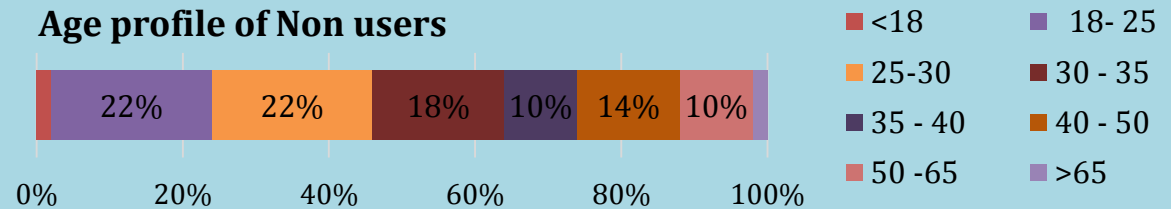


Male -
86%

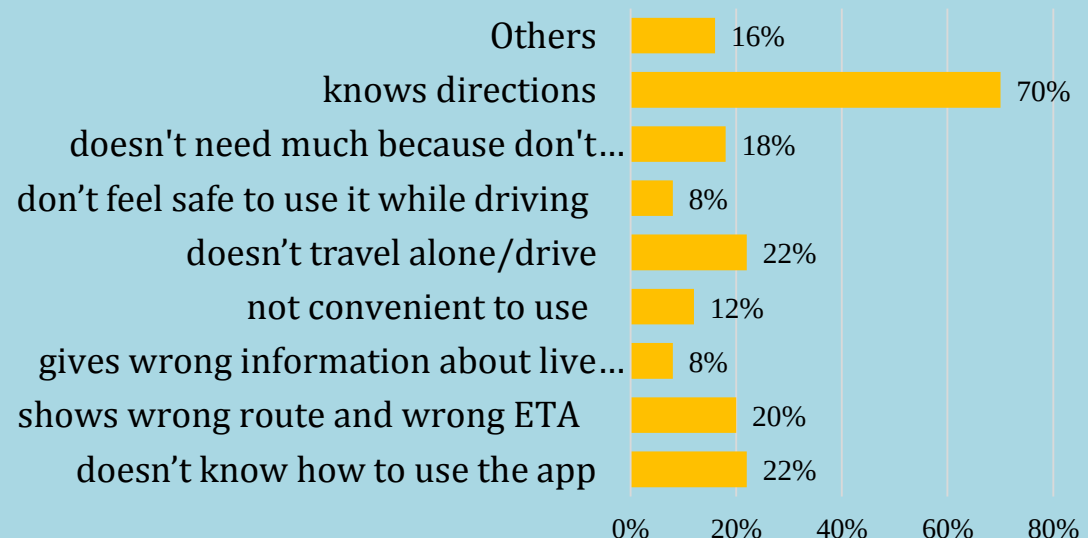


Female -
14%

Age profile of Non users



Reasons for Not Using the app



**Knows How
to use the
navigation
app**



72%



28%

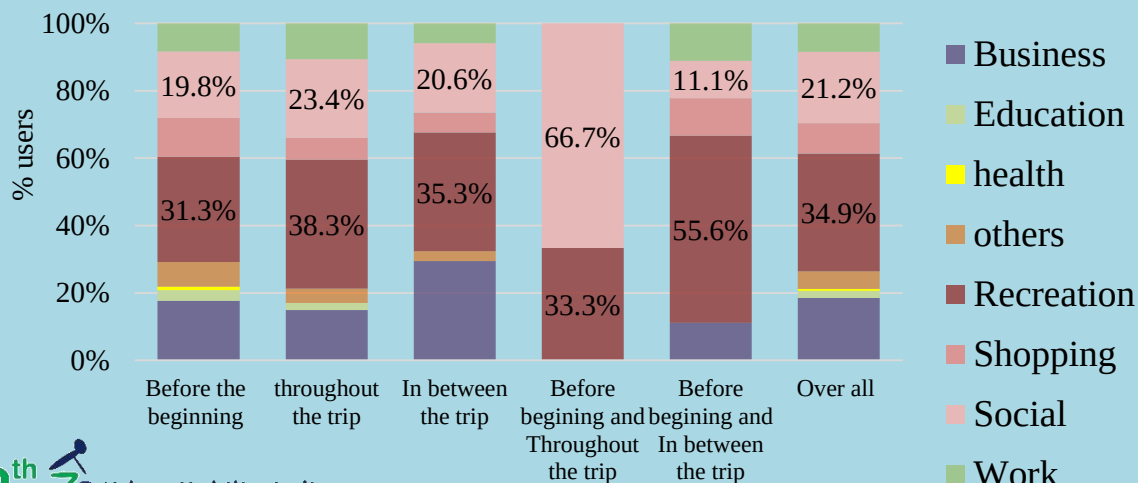
Travel Characteristics

• User Category wise Mode Share

Mode share of App users	Mode	Before beginning the trip	Throughout the trip	In between the trip	Before beginning and In between the trip	Before beginning and Throughout the trip
33.9%		44%	36%	13%	3%	5%
30.7%		50%	24%	24%	2%	0%
14.8 %		54%	11%	21%	14%	0%
14.8 %		68%	14%	14%	4%	0%
4.2%		50%	25%	25%	0%	0%
1.6%		33%	33%	0%	33%	0%

- All the categories users use the navigation app during **peak hours** only
- During **non-peak hours** - before beginning of the trip.
- ATL , Avg. Delay

User category wise Purpose of Trip



	ATL (km)	Avg. of time taken (min)	Avg. Delay (min)
Before the beginning	21.4	43.8	13
Before beginning & Throughout the trip	19.6	53	15
Before beginning & In between the trip	20.2	43	8
Throughout the trip	29.9	47.9	16
In between the trip	26.9	62.9	19
Over All	24.5	49.2	14

Comparison of travel behaviour before and after using the navigation app

AVERAGE APP USER ROUTE CHOICE



Time - 70%



Distance -14%

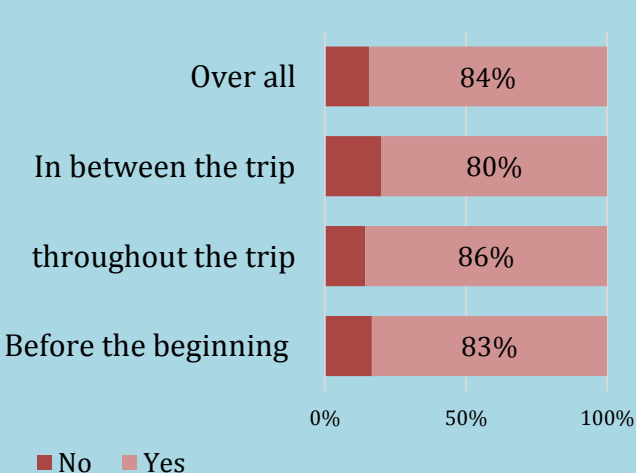


Cost -1%

Both time and Distance - 11%

Follow the same route or not

• Savings in Time and Distance



User Group	Avg. of time taken (min)		Avg. Trip Length (km)		Avg. Speed (km/hr)		Avg. Savings after using app			
	Before	Now	Before	Now	Before	Now	(min) ⌚	(km) 📍	(km/hr) 🚗	
Before the beginning	57.3	43.8	18.8	21.4	21.4	27.8	14	-2.6		6.4
Throughout the trip	62.9	47.9	25.5	29.9	20.5	28.8	15	-4.4		8.2
In between	65.0	62.9	20.5	26.9	22.8	26.4	2	-6.4		3.5
Over All	60.4	49.2	20.6	24.5	21.5	27.7	12	-3.9		6.2



Avg. time saving (12 min- 19%)



Speed increases 6.2 kmph (28%)

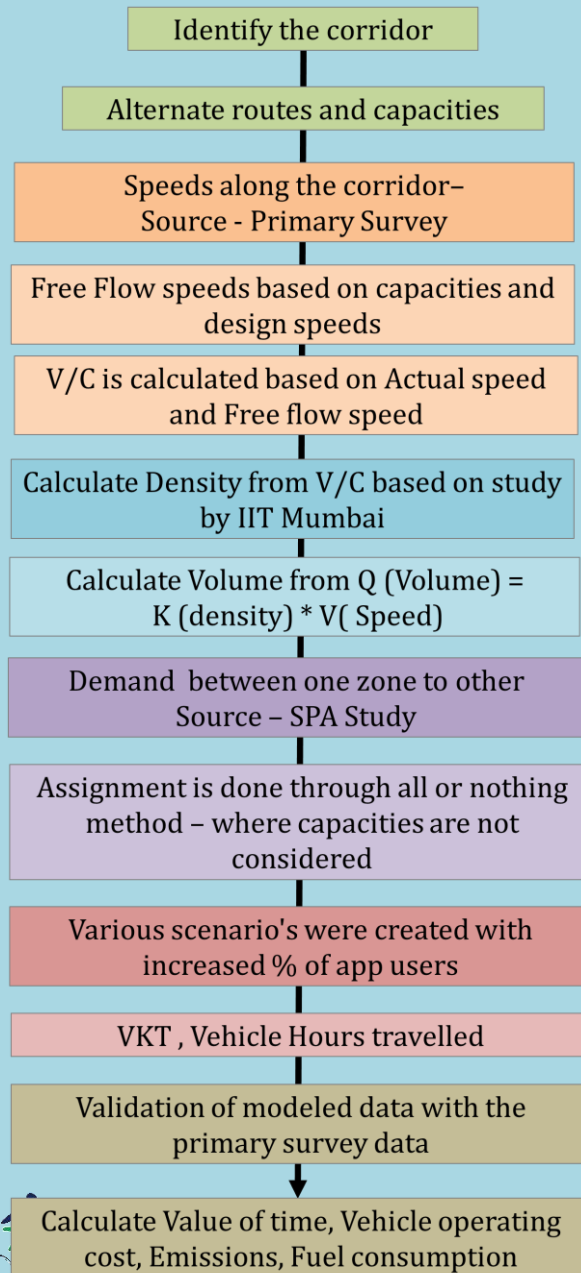


Travel extra 3.9km (15.9%)

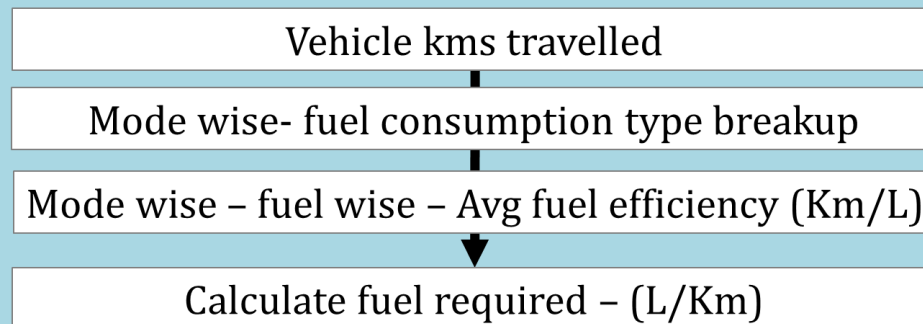
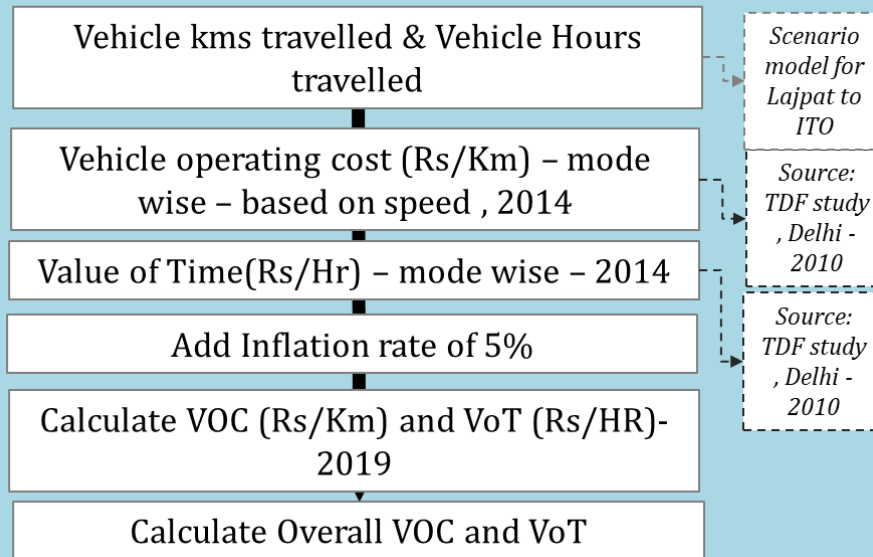
Category 1 are more benefited - 30% savings in time by travelling 12% extra distance

Only 18% of users are using the navigation app for planning a trip.

Case Study – Lajpat to ITO



Fuel Consumption, Value of Time and Vehicle Operating Cost Calculation



Source:
Primary
survey

Source:
Framework
for fuel policy
in Delhi,
Preeja Nair
,2013

	VOC (Km/Hr)	VOT (Rs/Hr)
2019	₹ 196.54	₹ 8.43

Fuel type	%	Avg Fuel Effc. (Km/L)	L/Km
Petrol	34%	13.8	0.072
Diesel	25%	18.1	0.055
CNG	41%	22	0.045

Case Study – Lajpat to ITO

Lajpat Metro station – ITO (SPA) 4 Alternative Routes

1 – **Mathura Road – ITO Junction (7.2km)**

2- **Pragati Maidan –Purana Qila (9.5 km)**

3- **Sarai Kale Khan – Baba Banda Singh Bahadur Setu ,
Lala Lajpat Rai Rd (11 km)**

4 – **NH 44 , Ring Road(11.5 km)**

Scenarios With Increased App Users



100% non app users
& 0% app users



70% non app users &
30% app users



50% non app users &
50% app users

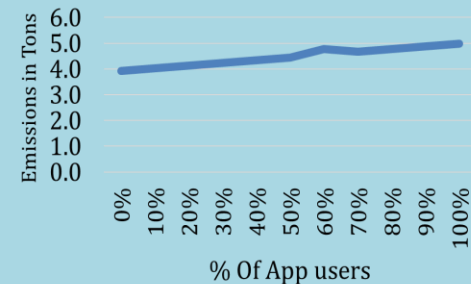


0% non app users &
100% app users

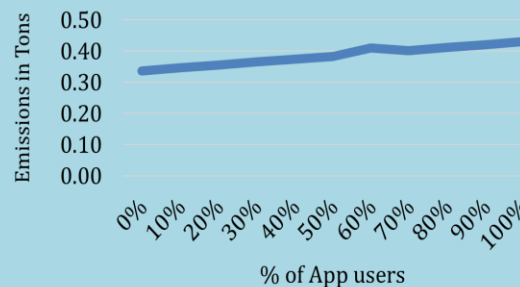
Case Study – Lajpat to ITO

App user	VKT –App User (km)	VKT – Non App User (km)	Total VKT (Km)	Total Vehicle Hours Travelled (hr)	Speed (km/hr)
0%	0	20618	20618	1229.5	16.8
10%	2629	18556	21185	1195.5	17.7
20%	5257	16494	21752	1152.3	18.9
30%	7886	14432	22319	1127.5	19.8
40%	10515	12371	22885	1112.0	20.6
50%	13144	10309	23452	1110.0	21.1
60%	13772	11342	25114	1369.8	18.3
70%	18401	6185	24586	1133.5	21.7
80%	21030	4124	25153	1158.8	21.7
90%	23658	2062	25720	1194.0	21.5
100%	26287	0	26287	1237.3	21.2

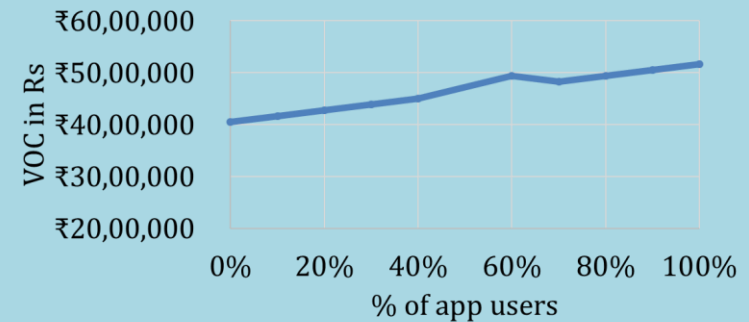
CO Emissions with increased App users



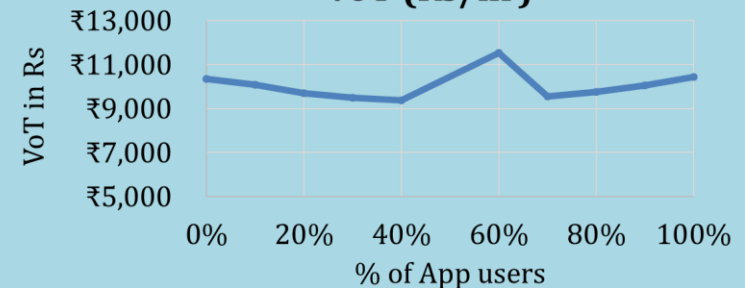
NOx Emissions with increased App users



VOC (Rs/Km)



VoT (Rs/hr)



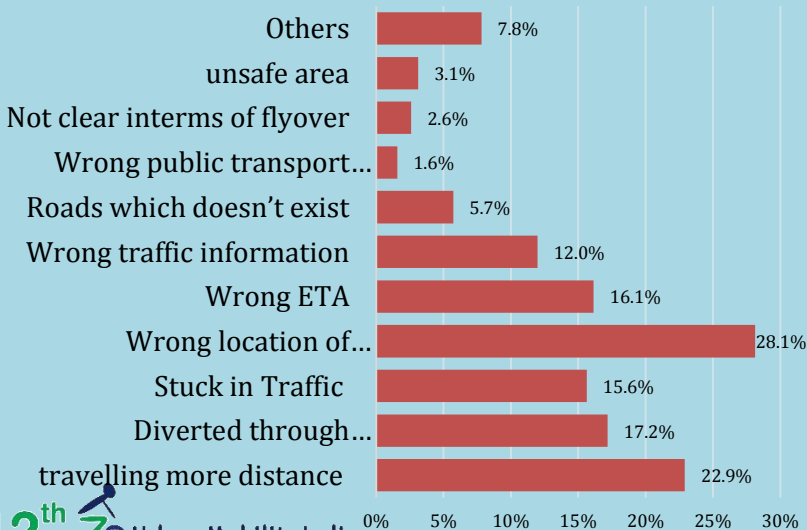
- **Extra 5669 vehicle kms travelled has been increased, even Vehicle Hrs is also increasing**
- **Extra Emissions are seen –3.2 tons CO₂, 0.09 tons NO_x and 1.1 tons CO**
- **V/C along the roads has been changing from 0.1 to 1**
- **Extra VOC - ₹ 11,14,240 VoT - ₹ 65**
- **88 kg of CNG, 79 Lt of Diesel and 167 Lt of Petrol is required**

Issues and Conclusion

Benefits

- 100% agree that they get one or other benefit – time saving & ease of finding new places
- + 29% agree that they transport cost has been reduced.
- + 34% of users feel that mobility became safe & 33% of users feel that Travelled Km are reduced

Issues - **62% of users** - Don't have any issues with the app



CONCLUSION

- Google maps is the most predominant one. Even though **Google maps** has different useful features, it **still lacks in many features**
- 70% of them think **time as a factor** to choose the shortest route
- people are travelling **16% of extra route length** for 12 min benefit

Additional features could be incorporated in it:

- Fuel cost should be given for the route
- Integration with traffic signals & Parking spaces availability
- Accurate timetable for Public Transport
- Integrating Cab services & Public Transport together within a trip.
- If any feature is added, notification should be given, and list of features should be there, so that users can know what features are present in the app.

Conclusion & Recommendations

Utilizing The Data From
Various Sources Of
Google – google Earth,
Google street maps

Integrate with
Government
Departments

Improving Live
Traffic Data

Assignment Method for
Route Choice

Incorporating Safe
Routes Option

Improvements in the
Navigation app

- Can collect data about
 - Carriage way , No. of lanes
 - Capacities of road – Govt.

Collect various
images of all localities
- Road Condition

Road Hierarchy , Signal Timings
Road Information – Construction works, diversions, blocks
Accident prone areas

Volume present in the corridor is calculated using Free flow
speeds, Density, and Speed using IIT Bombay study

Equilibrium Assignment - based on capacities of the road

Identify the routes which people don't feel safe by Showing them
images and asking them to rate using crowd sourcing

Notification option –
if travelling through accident prone area or unsafe area

THANK YOU