PREFERENCES OF PRIVATE DRIVERS FOR ADVANCED TRAVELLER INFORMATION SYSTEM IN TRIVANDRUM CITY

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INTRODUCTION

- Growing gap between travel demand and available capacity – requires efficient traffic management
- Intelligent Transportation System – maximize the capacity of infrastructure
- Advanced Traveller Information System (ATIS)
  - Provides real time information on traffic conditions
  - Helps to adjust routes, to minimize trip delays
- A properly designed traveller information system
  - can reduce traffic congestion
  - improve navigational performance
  - reduce fuel costs and air pollution

NEED FOR THE STUDY

- Design of ATIS should be based on information requirements obtained directly from the end users of the system.
- To find the prioritising factors of end users .
- Understanding traveller behaviour is an important consideration for developing traveller information system.

TRIVANDRUM CITY

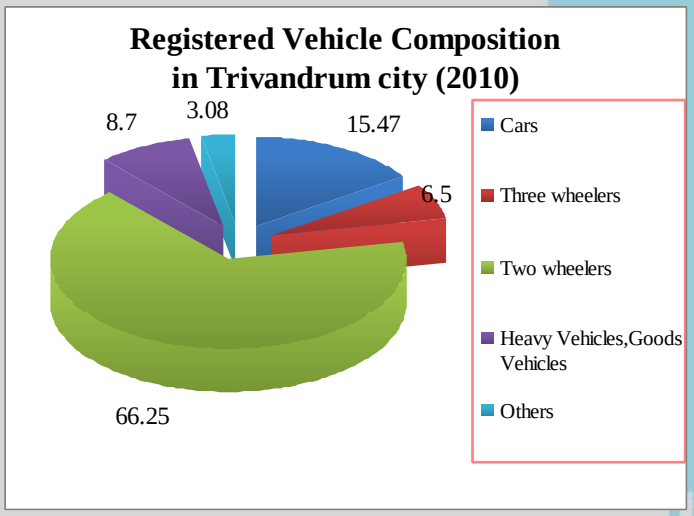
LARGEST AND MOST POPULOUS CITY IN KERALA

INHIBITANTS IN THE CITY PROPER → 9,57,000

THE ECONOMY IS UNDER TERTIARY SECTOR

ABOUT 50% OF WORKFORCE →

GOVT: SERVANTS



OBJECTIVES

- To bring out the information requirements for ATIS from the targeted road user groups.
- To develop mathematical models for predicting the user preferences and analyze its variation with respect to demographic and travel patterns of road users.

METHODOLOGY

- Road users in Trivandrum City - Heterogeneous group

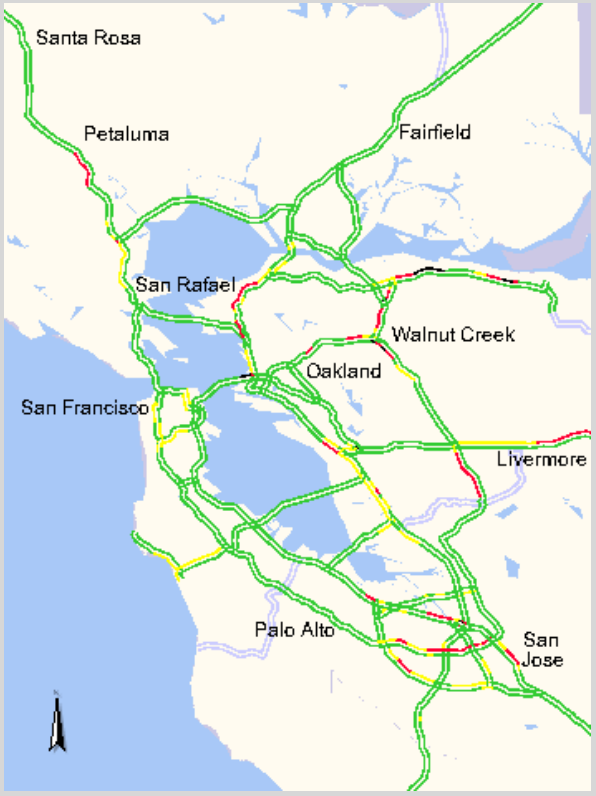
Private drivers

  - **Total 364 drivers**
  - **273 male drivers and 91 female drivers**

- **Data collection**

  Minimum time required for a questionnaire survey was around 20 minutes.

- **SPSS software was used for analysis and modeling**

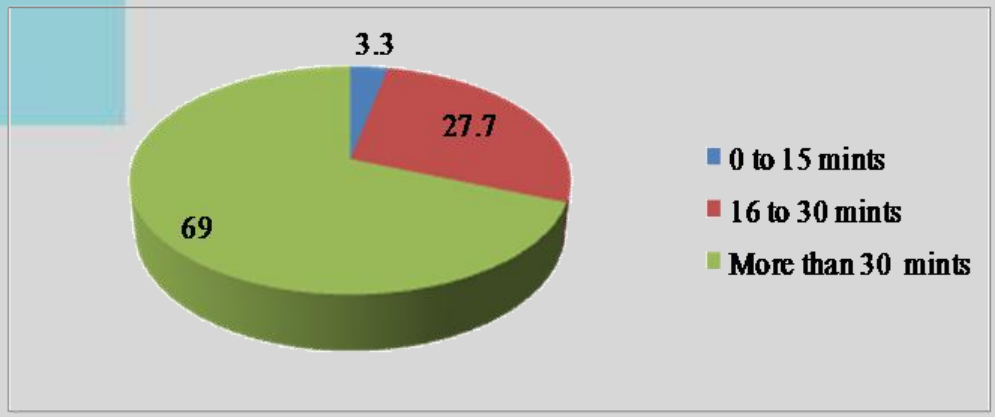


DATA ANALYSIS AND RESULTS

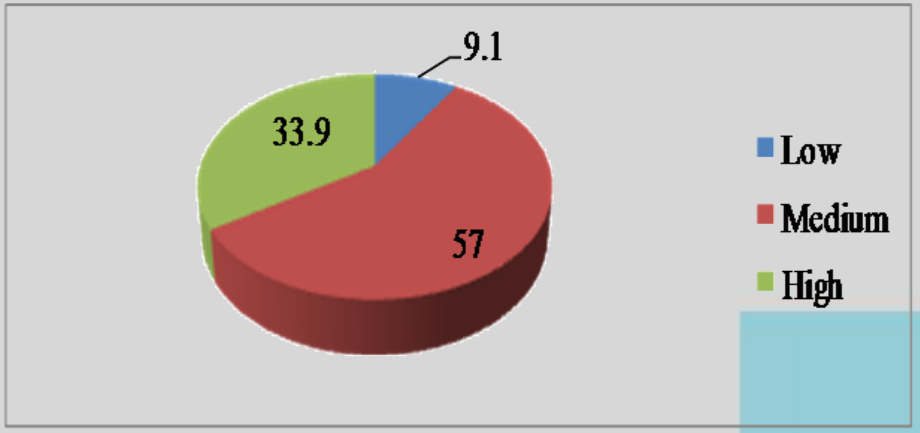
Socio economic characteristics of private drivers

CHARACTERISTICS	CLASSIFICATION			
AGE	52.3% 18 to 45 years	47.7% Greater than 45 years		
GENDER	72% Male	28% Female		
EDUCATIONAL QUALIFICATION	11.8% Up to 12th	55.8% Degree	32.4% Post Graduation	
OCCUPATION	1.1% Student	43.5% Government Employee	55.4% Private employee	
MONTHLY INCOME	1.1% Nil	28% Less than 10000	49.2% 10000 to 25000	21.7% Greater than 25000
FAMILIARITY WITH RESIDING PLACE	24.2% 0 t0 5 years	24.7% 6 to 15 years	51.1% More than 16 years	
DRIVING EXPERIENCE	22.8% 0 t0 5 years	36.3% 6 to 15 years	40.9% More than 16 years	

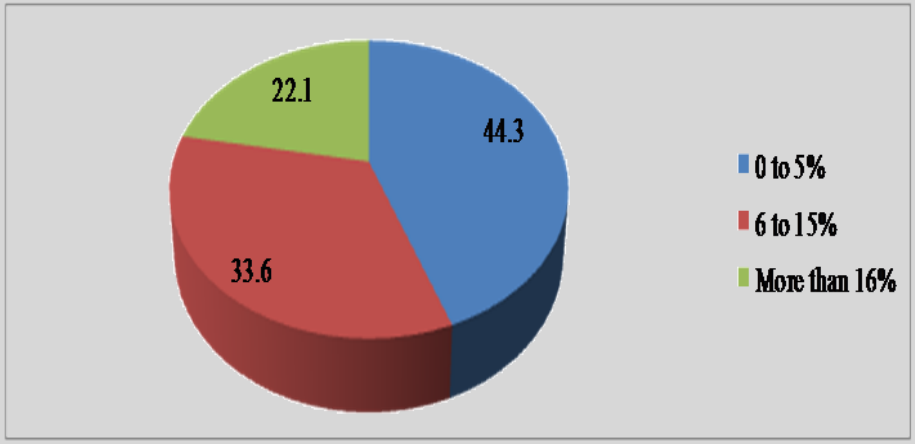
Work trip characteristics of private drivers



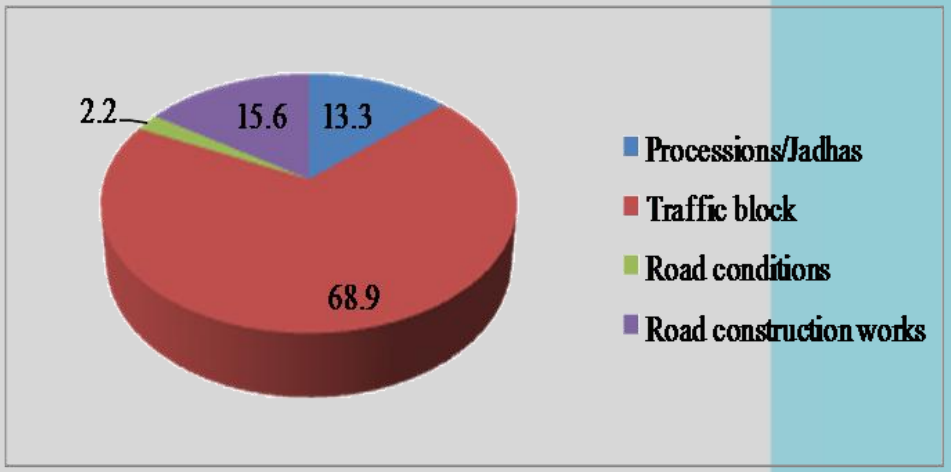
Work trip travel time of private drivers



Level of congestion during work trip of private drivers



Percentage usage of alternate routes during work trip of private drivers

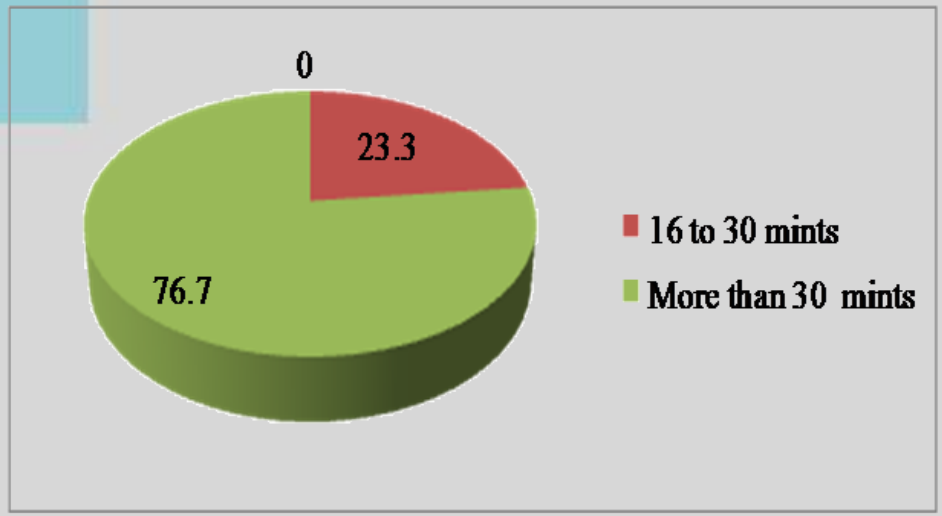


Reasons to take alternate routes during work trip of private drivers

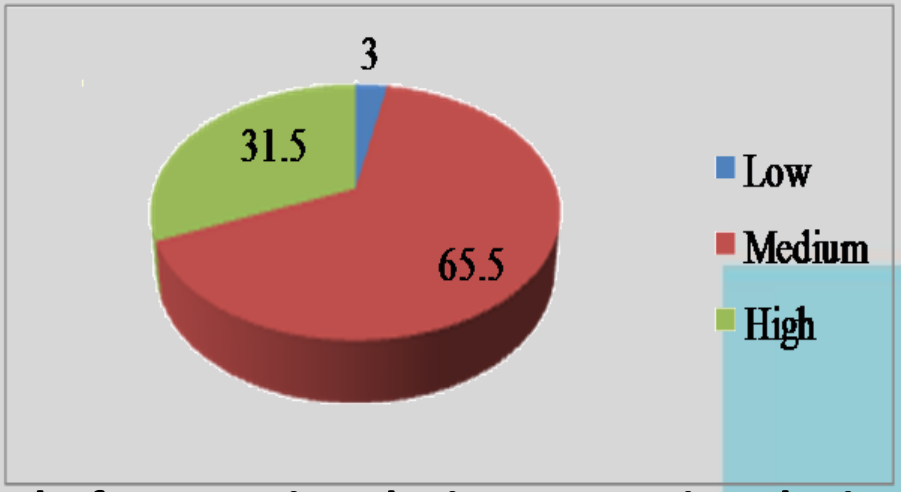
Importance of information to be known for work trip of private drivers

Information to be known for recreational trip	1st Priority	2nd Priority	3rd Priority	4th Priority	5th Priority
Traffic volume and delay	**60.7**	19	10.2	7.7	1.9
Road conditions	10.4	**39.6**	15.7	20.3	11.3
Accident and interruptions	11	14.8	13.7	**39**	20.9
Road construction works	17.9	23.4	**36.5**	22.5	3.6
Parking facilities	0	3.3	23.9	10.4	**62.4**

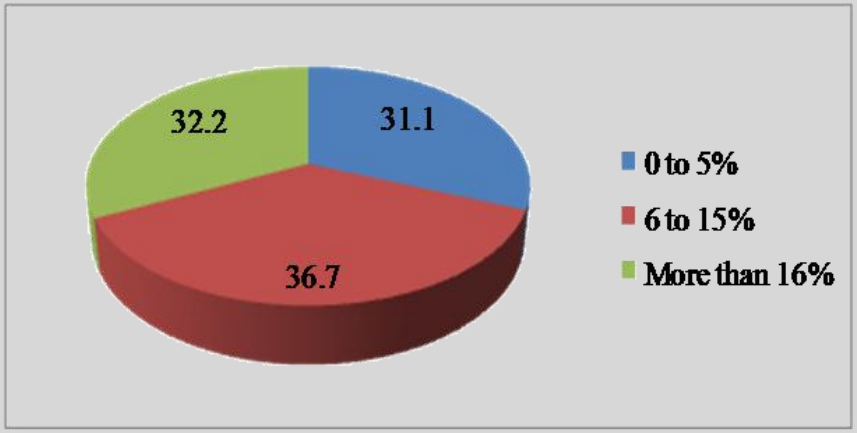
Recreational trip characteristics of private drivers



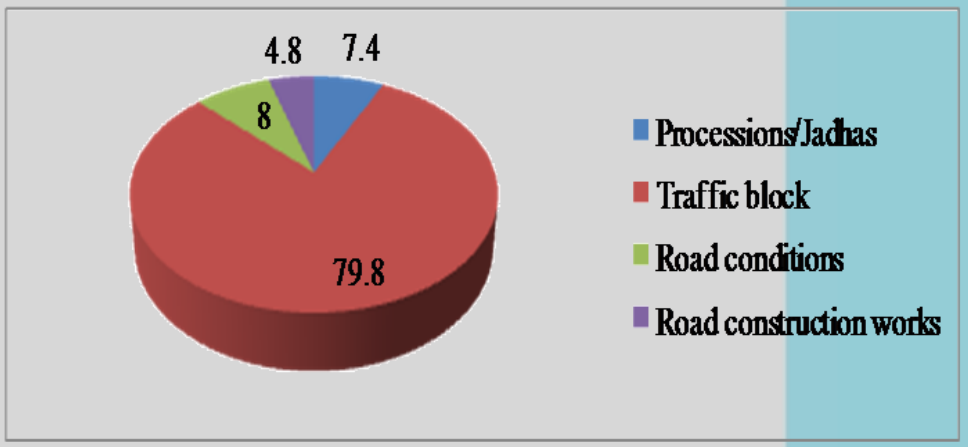
Recreational trip travel time



Level of congestion during recreational trip



Percentage usage of alternate routes during recreational trip

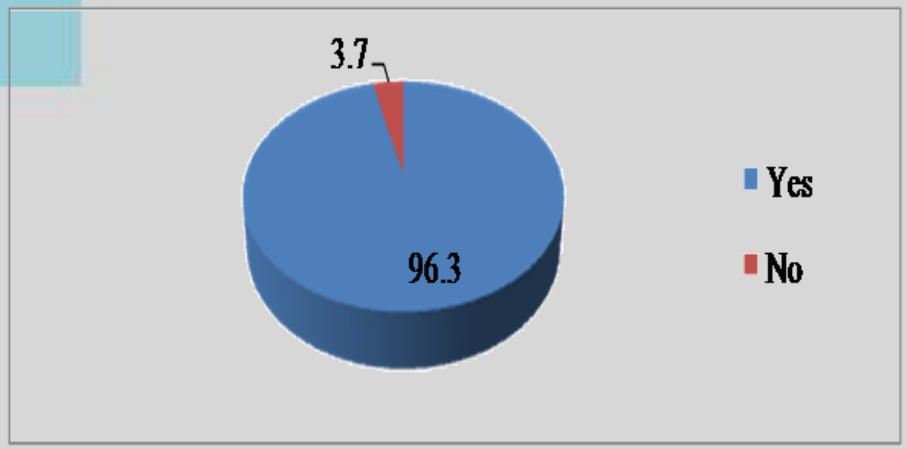


Reasons to take alternate routes during recreational trip

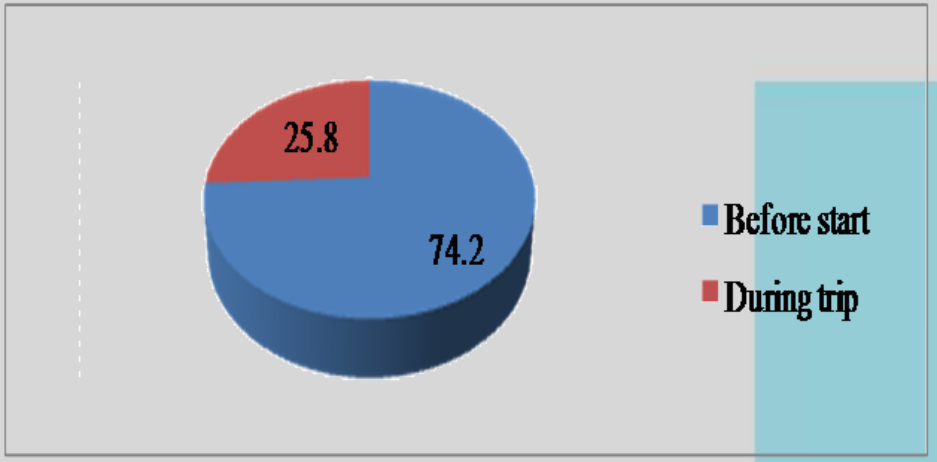
Importance of information to be known for recreational trip of private drivers

Information to be known for recreational trip	1st Priority	2nd Priority	3rd Priority	4th Priority	5th Priority	6th Priority	7th Priority
Road conditions	16.8	**28.4**	20.2	18.6	2.3	6.3	7.4
Traffic volume and delay	**51.4**	21.7	6.9	6.5	10.3	1.2	2
Accident and interruptions	8.7	7.2	8.4	16.6	17.5	25.4	16.2
Road construction works	3.8	11.6	**32.1**	16	16.7	13.7	6.1
Directions to destination	9	1.4	16.8	10.7	13.6	16.9	**31.6**
Road side facilities	3.8	5.5	6.6	10.4	**26.6**	**27.5**	19.6
Parking facilities	6.5	24.2	9	**21.2**	13	9	17.1

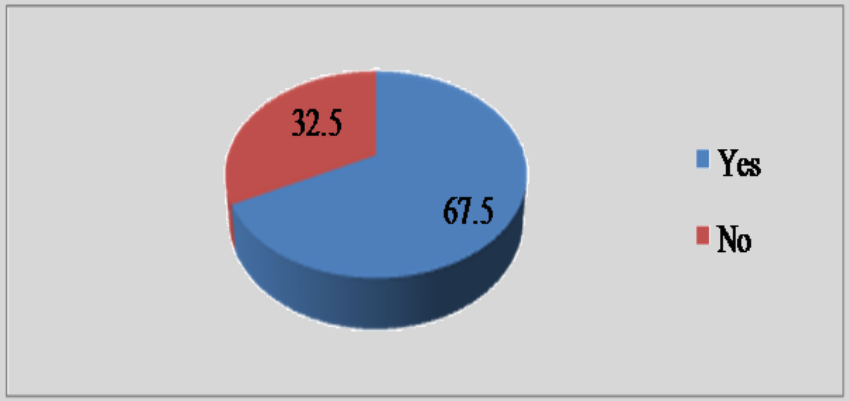
Preferences for ATIS by private drivers



Preference to use ATIS for private drivers

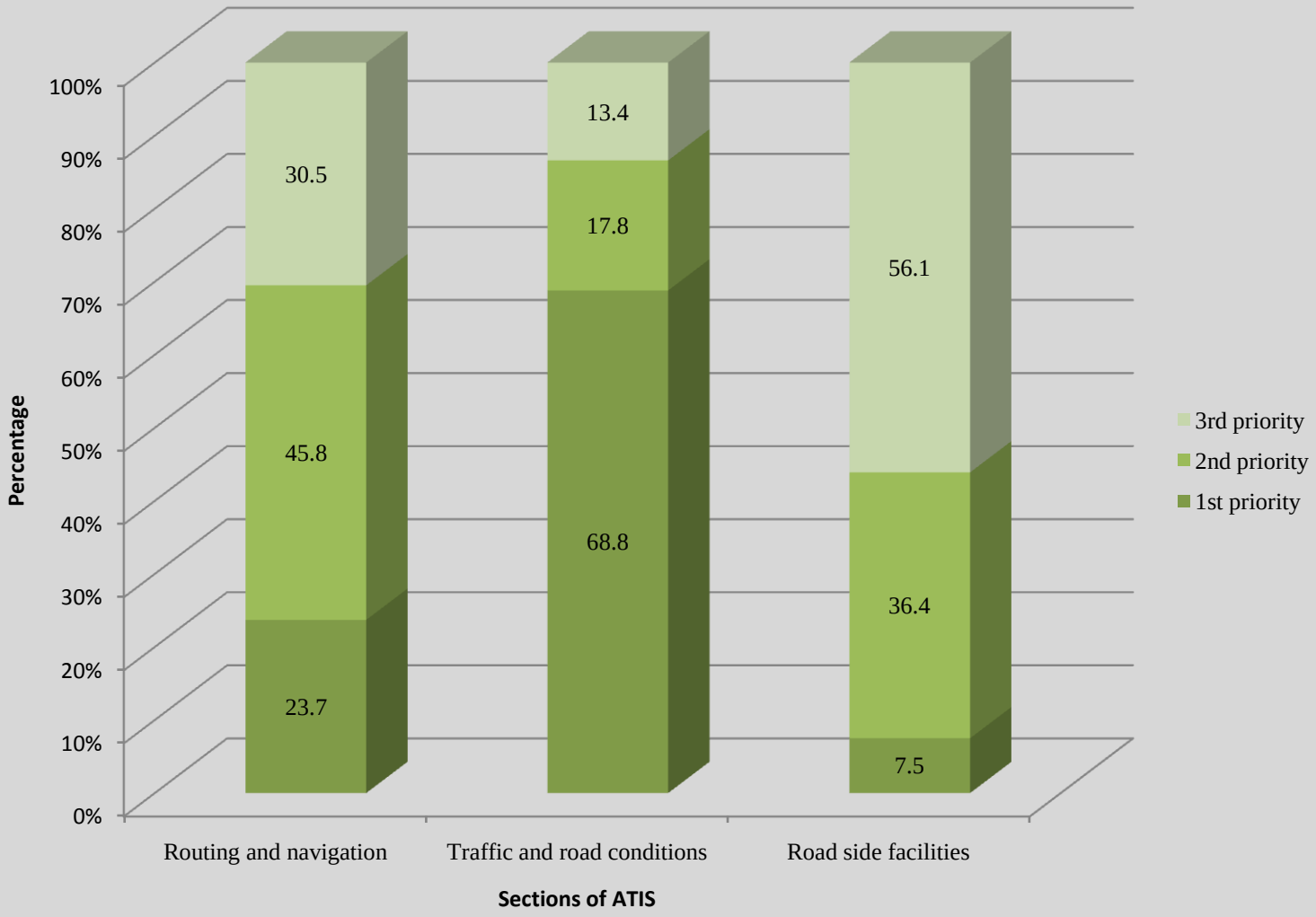


Preferred time for information for private drivers



Preference to pay for ATIS for private drivers

Preference for sections of ATIS for private drivers



Preferred source of information for private drivers

Sections of ATIS	1st Priority	2nd Priority	3rd Priority	4th Priority	5th Priority
On road VMS	18.7	19.9	19.7	**33.6**	10.1
In vehicle units	**45.2**	8.6	19.7	10.7	7.3
Websites	0	5.8	12.3	25.7	**63.2**
Mobile phones	33.2	**35.7**	21.2	7.9	3.2
Dial a call facility	2.2	29.9	**27.2**	22.1	16.2

Modelling of user preferences for private drivers

- The user preferences of private drivers for Advanced Traveller Information System vary with respect to their individual socio economic and travel characteristics.

- Logistic regression can be used to predict a dependent variable on the basis of continuous and/or categorical independents and to determine the effect of the independent variables on the dependent.

- It compares each level of the dependent with the reference category, for each independent variable.

Modelling of user preferences for private drivers

- Multinomial logistic models

$$\theta = \frac{e^{x}}{1+e^{x}}$$; where,

θ = Probability for choosing preferred event as first preference (compared to another preferred choice)

and

x = Function of socio economic and travel characteristics

Variables included in modelling private drivers preferences for ATIS

Variables (representation)	Categories within variables
Age (a)	1- younger, 2- older
Gender (b)	1-male, 2- female
Occupation (c)	1-government, 2- private firm
Education (d)	1 – up to 12^{th}, 2 – degree, 3 – post graduation
Monthly income (e)	1-10000 to 25000, 2- more than 25000
No of years of driving experience (f)	Nil
Mode of transport (g)	1-two wheeler, 2-four wheeler
No of years in the residing place (h)	Nil
Travel time of work trip (i)	Nil
Level of congestion during work trip (j)	1-low, 2-medium, 3- high
Percentage use of alternate routes (k)	Nil

Model for traffic volume and delay as the most preferred information for work trip routes

Variables	Coefficients	Odds ratio	Wald statistic	Significance
Intercept	5.91		22.515	0
Age	0.37	1.448	12.43	0
Gender	0.53	1.699	18.265	0
Occupation	0.09	1.094	10.273	0.02
No of years of driving experience	0.05	1.051	8.346	0.02
Mode of transport	0.52	1.682	16.732	0
No of years in the residing place	-0.16	0.852	4.576	0.03
Travel time of work trip	0.72	2.054	19.67	0
Level of congestion during work trip	-0.23	0.795	9.051	0.02

(Compared to road conditions)

Model for traffic volume and delay as the most preferred information for work trip routes

$$\theta = \frac{e^{x}}{1+e^{x}}$$

x =5.91+0.37a+0.53b+0.09c+0.05f+0.52g-0.16h+0.72i-0.23j

- Pseudo R^2 square (Nagelkerke) = 0.92
- Goodness of fit of the model (Deviance statistic) = 0.79.

- The Wald statistic is used to test the significance of individual logistic regression coefficients for each independent variable (that is, to test the null hypothesis in logistic regression that a particular logit (effect) coefficient is zero).

- Wald statistic is the square of the ratio of the parameter estimate to its standard deviation. Since the significance of the statistic for all variables is less than 0.05, all the variables contribute effectively for the model.

Model for traffic volume and delay as the most preferred information for recreational trip routes

Variables	Coefficients	Odds ratio	Wald statistic	Significance
Intercept	7.26		17.934	0
Age	-0.17	0.844	9.159	0.02
Gender	0.26	1.297	13.27	0.01
No of years of driving experience	0.12	1.127	8.54	0.02
Mode of transport	0.37	1.448	13.236	0.01
No of years in the residing place	-0.23	0.795	11.59	0.01
Travel time of work trip	0.54	1.716	17.5	0
Percentage use of alternate routes	0.68	1.974	19.67	0

(Compared to road conditions)

Model for traffic volume and delay as the most preferred information for recreational trip routes

$$\theta = \frac{e^x}{1+e^x}$$

x=7.26- 0.17a + 0.26b+ 0.12f+ 0.37g- 0.23h+ 0.54i+ 0.68k.

- Pseudo R^2 square (Nagelkerke) = 0.86
- Goodness of fit of the model (Deviance statistic) = 0.78

Model for in vehicle units as first preferred source for information

Variables	Coefficents	Odds ratio	Wald statistic	Significance
Intercept	5.86		28.97	0
Age	-0.49	0.613	14.462	0
Gender	-0.635	0.530	19.89	0
Education	-0.03	0.970	3.26	0.041
Monthly income	0.19	1.209	11.251	0
No of years of driving experience	-0.04	0.961	4.204	0.03
Mode of transport	0.26	1.297	10.09	0.02
Travel time of work trip	0.21	1.234	7.532	0.01
Level of congestion during work trip	0.03	1.030	5.437	0.01

(Compared to on road VMS)

Model for in vehicle units as first preferred source for information

$$\theta = \frac{e^{x}}{1+e^{x}}$$

x=5.89-0.49a-0.635b-0.03d+0.19e-0.04f+0.26g+0.21i+0.03j

- Pseudo R^2 square (Nagelkerke) = 0.83
- Goodness of fit of the model
  (Deviance statistic) = 0.74.

Model for information on traffic and road conditions as first preferred section of ATIS

Variables	Coefficients	Odds ratio	Wald statistic	Significance
Intercept	8.27		24.63	0
Age	-0.27	0.763	13.86	0
Gender	0.18	1.197	11.05	0
No of years of driving experience	-0.02	0.980	4.83	0.02
Mode of transport	0.46	1.584	17.53	0
No of years in the residing place	-0.03	0.970	6.781	0.01
Travel time of work trip	0.21	1.234	14.612	0

(Compared to section on routing and navigation)

Model for information on traffic and road conditions as first preferred section of ATIS

$$\theta = \frac{e^x}{1+e^x}$$

x = 8.27- 0.27a+ 0.18b- 0.02f+ 0.46g- 0.03h+ 0.21i

- Pseudo R^2 square (Nagelkerke) = 0.88
- Goodness of fit of the model (Deviance statistic) = 0.76

CONCLUSIONS

- **Introduction to ATIS was accepted by 96.3% of the private drivers.**

- **Regarding the information delivery units,**
  - **the private drivers had preference for in vehicle units, followed by mobile phones.**

- **67.5% of private drivers were willing to pay for ATIS.**

CONCLUSIONS (contd…)

- Multinomial logistic models: FOR PRIVATE DRIVERS

- The probability to know traffic volume and delay as their first preference, compared to road conditions is contributed by:

  - private drivers with age above 45 years,
  - female drivers,
  - private drivers with larger work trip travel time, and
  - private drivers travelling in four wheelers.

- The probability for having traffic volume and delay as the first preferred information along recreational trip route is contributed by:

  - private drivers whose age is between 18 to 45 years,
  - private drivers who change over to alternate routes more frequently in their present circumstances, and
  - private drivers who go for longer duration recreational trips.

CONCLUSIONS (contd…)

- In vehicle units are the most preferred mode of information delivery unit for:
  - male drivers,
  - private drivers with higher monthly income,
  - private drivers travelling in four wheelers, and
  - Private drivers with longer travel time for work trip.
- Within the various user services that can be implemented under ATIS, the section on providing traffic and road conditions is preferred by:
  - private drivers travelling by four wheelers,
  - female drivers,
  - private drivers who have long duration work trips, and
  - younger drivers (whose age is between 18 to 45).

CONCLUSIONS (contd…)

For implementation of ATIS in Trivandrum City

- Section on traffic and road conditions should have prime importance.
- Information requirement priorities are traffic volume and delay, road conditions, road construction works, directions to destination and parking facilities.
- In vehicle units and on road VMS require more time to get started for use - information delivery through mobile phones should can be started.
- These trends need to be analyzed regularly, as technology advances.

ACKNOWLEDGMENT

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THANK YOU