DEVELOPMENT OF A DESTINATION CHOICE MODEL FOR LEISURE TRIP - AHMEDABAD CITY

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Abstract: Transportation planning studies have always laid major emphasis on the destination choices of travelers. This research is based on the development of destination choice model for leisure trips based on analysis of data collected through questionnaire survey. The study also aims at determining the factors affecting choice of various destinations. Decision making process involves not only mode choices, but also the choices of trip destination, cost of trip and distance from home. Discrete choice models can be used to analyze and predict a decision maker's choice of one alternative from a finite set of mutually exclusive and collectively exhaustive alternatives. The data required for the study will be collected from selected locations of Ahmedabad city, including places of historic and religious importance, shopping center and water front areas.

The data required for the study is collected from five city places, out of the study places, Ahmedabad one and Lal Darwaja has shopping impotence, Kakariya is famed waterfront destinations and Kalupur Swaminarayan mandir has a distinct religious character. Adalaj stepwell has heritage importance. Personal interview technique is used to collect the relevant data using a self-administered questionnaire

The analysis of decision-making process is studied by developing models of the Multinomial logit model (MNL) is prepared for the leisure value of historical and religious importance, shopping center and water front areas.

The results would aid in predicting the trip making behavior as well as to observe the degree of influence of variables. The results would also help in formulating revisitation prospective for the leisure destinations.

Index Terms: **Destination choice, discrete choice models, Leisure trip, Mode choice, Transportation planning**

I. INTRODUCTION

Trips can be defined as movement of a person or commodity from an origin to a destination. The trips can be classified according to their movement between different zones, the characteristics of the trip end, purpose of trip, etc. When a trip is carried out for a purpose other than work, education and business then it can be called a Leisure trip.

Most of the leisure trips have their origin from cities and its periphery. Nationwide Personal Transportation Study (NPTS), Leisure trips (including trips for the purpose of exercising, relaxation, and entertainment) constitute about 12 percent of all urban trips on weekdays. This proportion rises to about 23 percent on weekends, when more Leisure trips are pursued. The NPTS data also indicate that the average Leisure trip length is around 21 km. Cities and their fringes have the advantages of convenient, access to night life, sports, performances, art displays, meetings and conventions, exhibitions, shopping, and outdoor.

The destination choice is made by alternative evaluation based on individual preferences and goals, when a person decides to make a trip, the first thing that comes to the mind is "where to go?". Out of the several destinations obtainable, the trip maker selects a destination by seeing the budget, time available, previous visits, personal or house hold characteristics, etc. This process is known as Destination choice.

After taking decision about destination choice, trip creator think about the travel mode that can be used for the trip. The trip maker has to decide based on the distance between the origin and destination, connectivity accessible for trip making, budget, climate condition, departure time and traffic condition on route etc. This is known as Mode choice.

In most urbanite areas, trip is secret into two segments based on purpose. One is work trips and another is nonwork trips. Usually urban planner accent more on work trips. Many current studies have shown the need to model nonwork trips more systematically. These studies have also shown behavioral differences underlying travel decisions for different types of nonwork trips.

II. RESEARCH OBJECTIVE

- To study various factors affecting choice of various destination.
- To develop destination choice model for leisure trips based on analysis of collected data through questionary survey.

Need for The Study

In most metropolitan areas, trip is classified into two segments based on purpose. One is work trips and another is nonwork trips. Usually urban planner emphasis more on work trips. Many recent studies have shown the need to model nonwork trips more systematically. These studies have also shown behavioral differences underlying travel decisions for different types of nonwork trips.

Scope of Study

For Destination Choice Model, the leisure places considered are historical/cultural heritage, water front area, shopping centers and religious places. Out of the various leisure destinations in Ahmedabad, five destinations are selected. Adalaj Step Well, Lal Darwaja, Swaminarayan Temple, Kakariya lake, Ahmedabad one are Selected.

III. DATA COLLECTION AND FACTER ANALYSIS.

Five leisure destinations, namely, Ahmedabad one, Kakariya lake, swaminarayan temple, Lal Darwaja,and Adalaj step well were selected to collect data on leisure travel from visiters. Based on primary leisure value these cities were categorized as waterfront destinations (kakariya lake), historical and cultural heritage destinations (Adalaj step well) and religious destinations (swaminarayan temple).

300 visiters were contacted at each of the destination and 15% of the usable sample was kept for validation. Information was collected through personal interview using a self-administered google form. The information included details of mode related aspects such as travel time, travel cost and the importance ratings for qualitative attributes; household information such as monthly household income, family composition; and trip related information such as the frequency of travel, budget and group size.

Factor analysis, with Kaiser normalization and oblimin rotation is used to uncover the latent constructs influencing destination choice. SPSS (version 25.0) software is used for conducting the factor analysis. Before proceeding with factor analysis, the adequacy of sample size is checked using K-M-O test statistic. It is calculated as given by Equation(1) given below.

$$KMO = \frac{\sum_{i \neq j} \sum r_{ij}^2}{\sum_{i \neq j} \sum r_{ij}^2 + \sum_{i \neq j} \sum a_{ij}^2} \quad \text{.....1}$$

Where $\Sigma\,\Sigma$ = sum over all items in the matrix when item $i \neq j$,rij = Pearson correlation between items i and j ,aij = Partial correlation coefficient between items i and j.

K-M-O measure ranges from 0 to 1, with smaller values indicating that factor analysis would be unwise. Kaiser (1974) have suggested the following criteria for evaluating the size of K-M-O statistic, Above 0.9 - "Superb"; 0.8-0.9 -"Great", 0.7- 0.8 - "Good", 0.5-0.7 -"Mediocre", and < 0.5 -"Barely acceptable".

Another test, known as Bartlett's test, is conducted to examine the feasibility of carrying out exploratory factor analysis. Bartlett's test of sphericity tests the null hypothesis that the correlation matrix is an identity matrix, i.e., there is no correlation between the items. Bartlett's test is a chi-square test and is computed using Eq. (2). The degrees of freedom for this chi-square.

$$\chi^2 = -\left[(N-1) - \left(\frac{2k+5}{6}\right)\right] \log_e |R| \quad \text{.....2}$$

where $\chi 2$ = calculated value for Bartlett's test; N = sample size; k = number of items or variables in correlation matrix; R is the determinant of the correlation matrix.

IV. DATA ANALYSIS

The data has been analysed under three headings, namely household characteristics, travel characteristics and perception characteristics. The household characteristics deal with the data regarding the household income, family members, etc. The travel characteristics deal with the data regarding the planning, travel, destination. The perception characteristics, as the name suggests, deals with the data regarding perception of the travellers towards various affecting factors related to destination choice, revisit information, etc. These are discussed in successive sections below.

Household income and age group

The sample is categorized into seven income groups according to the monthly household income. Table 1 gives the distribution of the sample according to the monthly household income. It can be seen that the general income range of the visitors to all Five locations is Rs.20001-Rs.35000. About 91.86% of visitors in lal darvaja, 65%-69% of visitor in Kakariya and Adalaj stepwell, 56.88% of visitor in Kalupur Swaminarayan mandir come under this range. In Ahmedabad one, visitors more than 70.52% are in the income group of Rs.20001-Rs.35000. However, the major income group was found to be Rs.20001-35000 with 24.33% as the percentage share out of the samples from Adalaj step well. The General household income of all the destinations was coming in the range of Rs.20001-Rs.35000, the highest in Ahmedabad one and lowest in Lal darvaja.

The sample is categorized into Eight groups according to age of visitors. It can be seen that the general age range of the visitors to all Five locations is 18-23 year. About 56.56% of visitors in lal darvaja, 40%-51% of visitor in Kakariya and Adalaj stepwell, 42.16% of visitor in Ahmedabad one come under this range. In Kalupur Swaminarayan mandir, visitors more than 79.19% are in the Age group of 18-23 year.

Table 1 frequency of house hold income

Monthly Household Income	Adalaj step well	Ahmedabad one	Kakariya lake	Kalupur Swaminarayan mandir	Lal Darwaja
<10,000	20	17	35	26	105
10,001-20,000	39	14	61	43	85
20,001-35,000	92	48	73	84	81
35,001-50,000	38	65	54	85	17
50,001-75,000	27	63	27	27	6
75,001-1, 00,000	4	40	2	2	0
>1 lakh	1	21	3	2	1

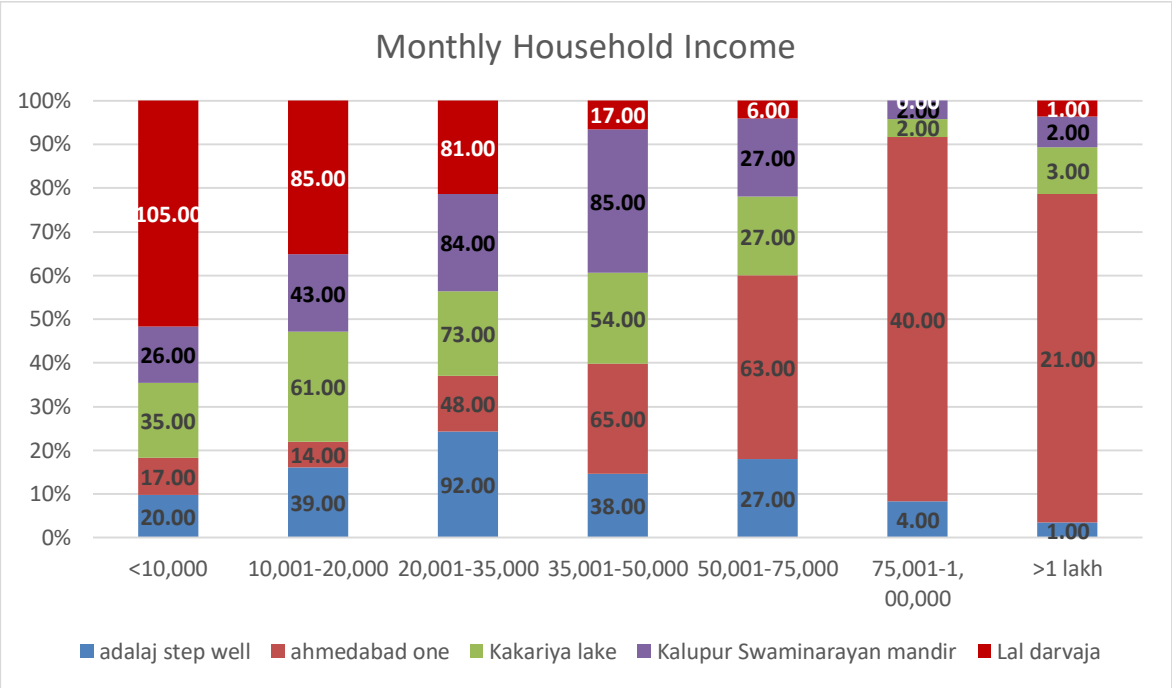


Fig 1 monthly household income

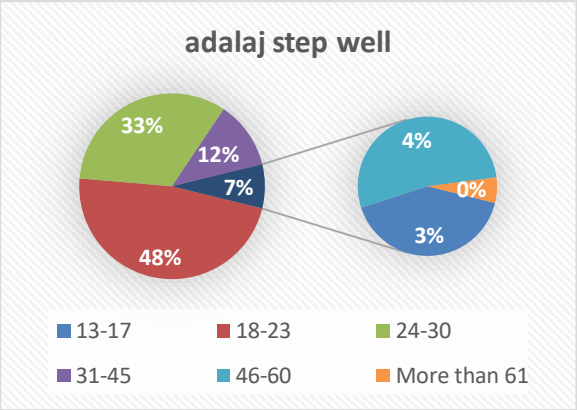


Fig 2 Age group of Adalaj stepwell

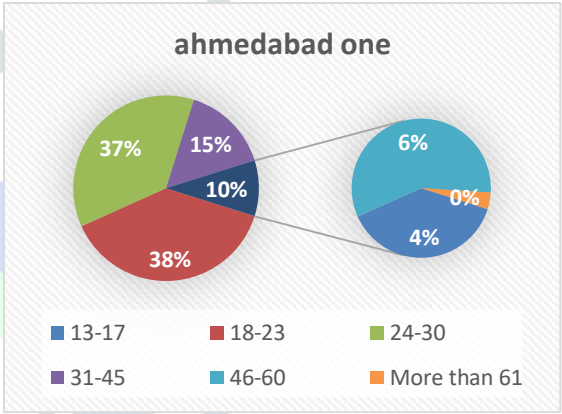


Fig 3 Age group of Ahmedabad one

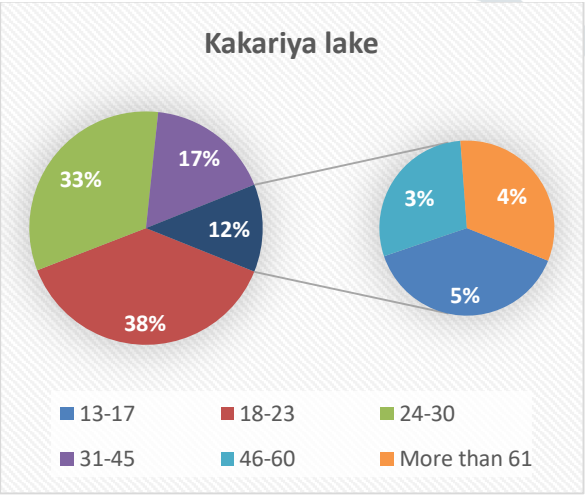


Fig 4 Age group of Kakariya lake

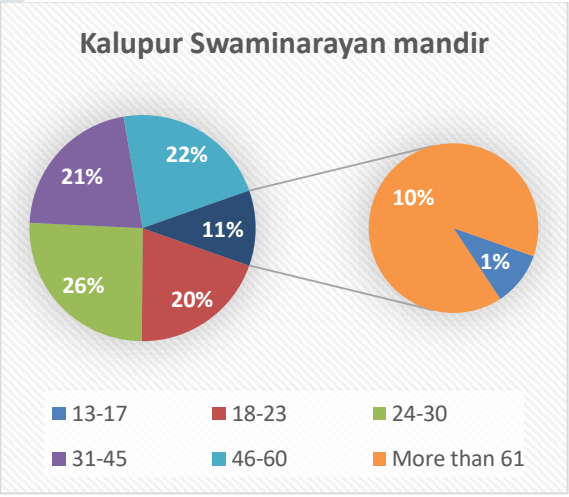


Fig 5 Age group of Kalupur mandir

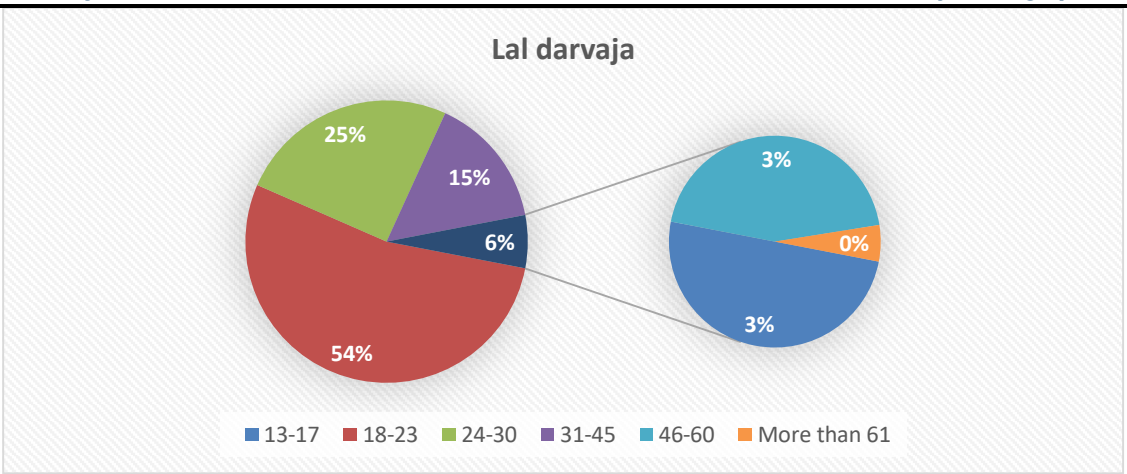


Fig 6 Age group of Lal Darwaja

Trip cost and origin of trip

It can be seen that the general Trip cost range of the visitors to all Five locations is 18 to 22. About 83.83% of visitors in lal Darwaja, 78%-87% of visitor in Kalupur Swaminarayan mandir and Kakariya, 58.58% of visitor in Ahmedabad one come under this range. In Adalaj stepwell, visitors more than 60.64% are in the Trip cost of 18 to 22. The General Trip cost of leisure place for all the destinations was coming in the range of 18 to 22, the highest from Adalaj and lowest from Kalupur Swaminarayan mandir.

Maximum people are coming from West zone and new west zone to visit Ahmedabad one place. In Kakariya lake majority of visitor are from south zone and central zone. From central zone, a greater number of people are preferred to go Kalupur Swaminarayan mandir than Adalaj stepwell and Ahmedabad one.

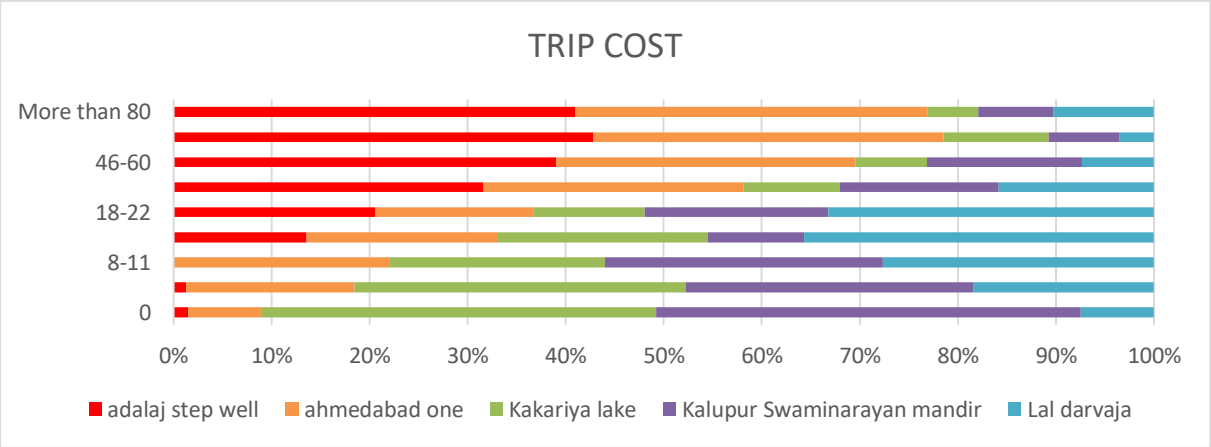
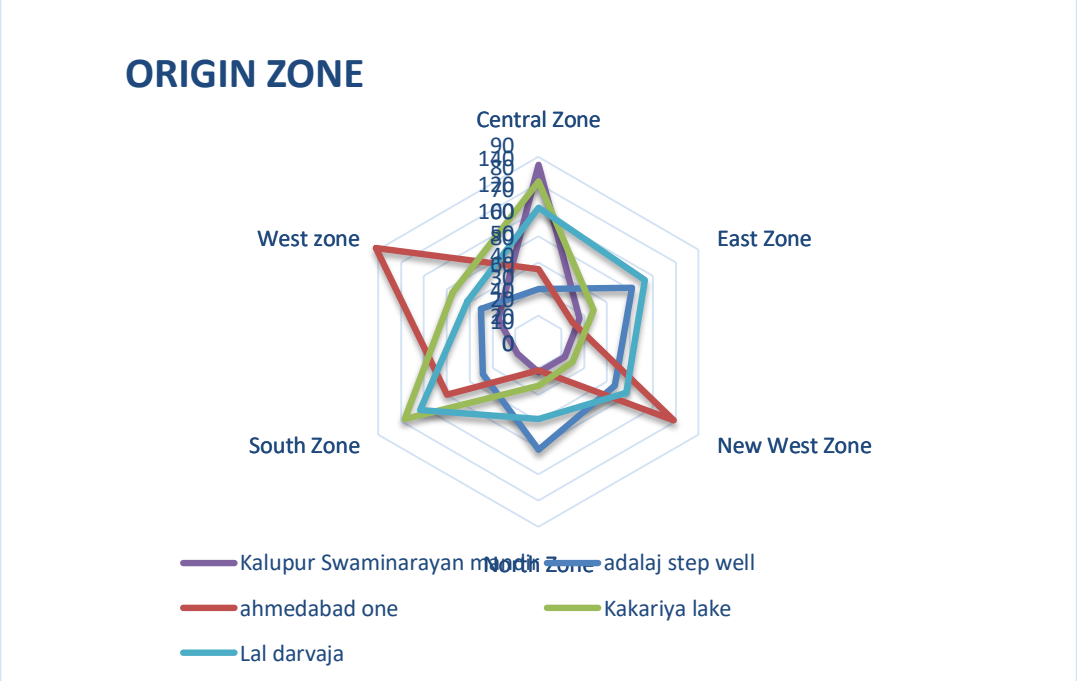


Fig 7 Stacked chart of Trip cost



Multinomial Logit model

It is a common assumption that errors are normally distributed. For choice analysis however, the error fraction is assumed to be following Gumbel distribution. The logit formulation is a share model that divides the persons between the various alternatives depending on each alternative's relative desirability.

The general expression for the probability of choosing an alternative 'i' (I = 1, 2, 3...J) from a set of J alternatives is,

$$\Pr(i) = \frac{\exp(V_i)}{\sum_{j=1}^{J} \exp(V_j)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3$$

Where Pr(i) = probability of the individual choosing alternative I, V = deterministic component of the utility of alternative j. Multinomial Logit model can be used for prediction and inference problem solving. Prediction problem means predicting the choice of Destination (leisure place). Inference means How does the factors such as Length of trip, trip cost, and household income affect Destination choice model.

V. MODEL DEVLOPMENT

As described before, data were collected basically for four leisure values. Under historical and cultural heritage value, Adalaj stepwell and lal Darwaja were chosen. For religious value Kalupur Swaminarayan mandir and lal Darwaja were taken, for water front Kakariya lake was taken. And for recreational Ahmedabad one was taken. For all the five locations a minimum of 300 samples were collected. Out of these data, the samples of planned trips were taken for the modelling purpose.

Model of household income

$$\text{Log}\left(\frac{Ahmedabad}{Adalaj}\right) = 3.045 - 3.302(1) - 4.069(2) - 3.695(3) - 2.32(4) - 2.12(5) - 1.72(6) + 0(7) \quad \ldots\ldots\ldots\ldots\ldots\ldots 4$$

$$\text{Log}\left(\frac{Kakariya\ lake}{Adalaj}\right) = 1.099 - 0.634(1) - 0.651(2) - 1.33(3) - 0.54(4) - 1.02(5) - 2.80(6) + 0(7) \quad \ldots\ldots\ldots\ldots\ldots\ldots 5$$

$$\text{Log}\left(\frac{KSM}{Adalaj}\right) = 0.69 - 0.20(1) - 0.59(2) - 0.78(3) - 0.41(4) - 1.07(5) + 0.73(6) + 0(7) \quad \ldots\ldots\ldots\ldots\ldots\ldots 6$$

$$\text{Log}\left(\frac{Lal\ Darvaja}{Adalaj}\right) = 1.099 + 0.46(1) - 0.32(2) - 1.22(3) - 1.76(4) - 2.52(5) - 3.49(6) + 0(7) \quad \ldots\ldots\ldots\ldots\ldots\ldots 7$$

- **Coding of Equation:**

Coding value	Leisure place	Income group
1	Ahmedabad one	<10,000
2	Kakariya lake	10,001-20,000
3	Kalupur Swaminarayan mandir	20,001-35,000
4	Lal Darwaja	35,001-50,000
5	-	50,001-75,000
6	-	75,001-1, 00,000
7	-	>1 lakh

Table 2 Statistics for best fit model for income group

leisure place		B	leisure place		B	leisure place		B	leisure place		B
1	Intercept	3.045	2	Intercept	1.099	3	Intercept	0.693	4	Intercept	1.099
	[1.00]	-3.302		[1.00]	-0.634		[1.00]	-0.201		[1.00]	0.464
	[2.00]	-4.069		[2.00]	-0.651		[2.00]	-0.596		[2.00]	-0.320
	[3.00]	-3.695		[3.00]	-1.330		[3.00]	-0.784		[3.00]	-1.226
	[4.00]	-2.320		[4.00]	-0.544		[4.00]	-0.414		[4.00]	-1.760
	[5.00]	-2.120		[5.00]	-1.022		[5.00]	-1.079		[5.00]	-2.526
	[6.00]	-1.729		[6.00]	-2.803		[6.00]	0.738		[6.00]	-3.497
	[7.00]	0[b]		[7.00]	0[b]		[7.00]	0[b]		[7.00]	0[b]

a. The reference category is: Adalaj stepwell.
b. This parameter is set to zero because it is redundant.

Calibration of Model

Model Fitting Information

Model	Model Fitting Criteria -2 Log Likelihood	Likelihood Ratio Tests Chi-Square	df	Sig.
Intercept Only	532.694			
Final	124.920	407.774	24	.000

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	.000	0	.
Deviance	.000	0	.

Likelihood Ratio Tests

Effect	Model Fitting Criteria -2 Log Likelihood of Reduced Model	Likelihood Ratio Tests Chi-Square	df	Sig.
Intercept	124.920[a]	.000	0	.
Monthly Household Income	532.694	407.774	24	.000

Probability of Destination

Table 3 probability of various Destination based on Income Group

probability	Adalaj stepwell	Ahmedabad one	Kakariya lake	Kalupur Swaminarayan mandir	Lal Darwaja
<10000	0.50	**0.44**	0.61	0.62	**0.83**
10001-20000	0.50	**0.26**	0.61	0.52	**0.69**
20001-35000	**0.50**	**0.34**	0.44	0.48	0.47
35001-50000	0.50	**0.67**	0.64	0.57	**0.34**
50001-75000	0.50	**0.72**	0.52	0.40	**0.19**
75001-100000	0.50	0.79	0.15	**0.81**	**0.08**
> 1 Lakh	**0.50**	**0.95**	0.75	0.67	0.75

VI. MODEL VELIDATION

- Number of observations processed = 250

Table 4 Destination choice predicted for various leisure places

Destination	Adalaj stepwell	Ahmedabad one	Kakariya	Kalupur temple	lal Darwaja	total
Adalaj stepwell	**30**	5	2	1	3	42
Ahmedabad one	6	**32**	6	3	4	51
Kakariya	2	4	**31**	5	6	47
Kalupur temple	1	5	5	**37**	4	52
lal Darwaja	4	3	5	4	**41**	57
total	43	50	49	50	58	250

$$\text{Percent Right} = \frac{30 + 32 + 31 + 37 + 41}{250}$$

Percent Right = 68.4 %

Table 5 Prediction success for Leisure places

Destination	share observation%	share predicted %
Adalaj	16.91	17.22
Ahmedabad one	20.51	19.97
Kakariya	18.84	19.51
Kalupur temple	21.02	20.12
lal Darwaja	22.73	23.18
total	100.00	100.00

- It can be seen that for all alternatives, the share of alternatives predicted is almost equal to the share observed. The model which have been prepared for destination choice is 68.4 % predicted True as Show Table 4 and Table 5.

VII. CONCLUSION

1. From the study, it was concluded that household characteristics and travel characteristics like income group, age, mode of travel, distance, and time proffered of departing have great influence over the decision-making process in destination choice.
2. For <10000 income group, If One person having income less than ten thousand visits Adalaj, then at the same time 4.77 times people can Visit Lal Darwaja and 0.77 times people can visit Ahmedabad one.
3. For 10001-20000 income group, If One person having income ranging from ten thousand one to twenty thousand visits Adalaj, then at the same time 2.18 times people can Visit Lal Darwaja and 0.36 times people can visit Ahmedabad one.
4. For 35001-50000 income group, If One person having income ranging from thirty-five thousand one to fifty thousand visits Adalaj, then at the same time 2.06 times people can Visits Ahmedabad one and 0.52 times people can visit Lal Darwaja.
5. Household income is an important factor as the household income group increases, their visits to the Ahmedabad one also increases and visits to Lal Darwaja and Kakariya decreases.
6. For 50001-75000 income group, If One person having income ranging from fifty thousand one to seventy thousand visits Adalaj, then at the same time 2.52 times people can Visits Ahmedabad one and 0.24 times people can visit Lal Darwaja.
7. Kalupur Swaminarayan temple is a religious place. Every person can visit their god. People are not bound by certain income group in order to visit their god. One Person's visit to Swaminarayan Temple does not depend on his/her household income. in morning hours.
8. At Adalaj stepwell, it can be seen that major visitors having income group 20001-35000 are of age group 18-23.
9. At Ahmedabad one, it can be seen that major visitors having income group 35001-50000 are of age group 24-30.
10. At Ahmedabad one, it can be seen that major visitors having income group 20001-50000 are of age group 18-23.
11. At Ahmedabad one, it can be seen that major visitors having income group 50001-75000 are of age group 31-35.
12. At Kakariya lake, it can be seen that major visitors having income group 20001-35000 are of age group 18-23.
13. At Kakariya lake, it can be seen that major visitors having income group 35001-50000 are of age group 24-30.
14. At Kalupur Swaminarayan temple, it can be seen that major visitors having income group 10001-20000 are of age group 18-23.
15. At Kalupur Swaminarayan temple, it can be seen that major visitors having income group 20001-35000 are of age group 24-30.
16. At Kalupur Swaminarayan temple, it can be seen that major visitors having income group <10000 are of age group 18-23.

IV. REFERENCES

[1] Aktas, A., Aksu, A and Beykan, I. "Destination Choice: An Important — Satisfaction Analysis", Quality & Quantity, Springer Science, (2006) Vol.41,265-273.

[2] Beerli, A., Meneses, G. and Moreno, G.S."Self-Congruity and Destination Choice", Annals of Tourism Research, Elsevier Ltd., Great Briton, (2007) Vol. 34, 571-587.

[3] HariKrishna, M. and Rastogi, R. (2012), Identification of decision parameters influencing destination choices of Indian domestic tourists, International Journal of Physical and Social Sciences, vol. 2(1), International Journals of Multidisciplinary Research Academy, 233-263. (e-Journal)

[4] HariKrishna, M. and Rastogi, R. (2013), Social and psychological factors influencing destination preferences of domestic tourists in India, Leisure Studies, vol. 32 (2), Routledge, Taylor and Francis, UK, 207-217.

[5] Kozak, M. "Repeaters' Behaviour At Two Distinct Destinations", Annals of Tourism Research, Elsevier Ltd., Great Briton, (2001), Vol. 28, 784-807

[6] Pozsgay and Bhat "Destination Choice Modelling for Home-Based Recreational Trips, Analysis and Implications for Land-Use, Transportation, and Air Quality Planning", Presented at 80th Annual Meeting of the Transportation Research Board, Washington, D.C. 2001.

[7] Rayviscic Mutinda, Melphon Mayaka, "Application of destination choice model: Factors influencing domestic tourists destination choice among residents of Nairobi,Kenya",Tourism Management,Elseiver Science Ltd, (2012),Vol.33, 1593-1597

[8] Rastogi, R., Harikrishna, M., and Jacob, Mani (2014), Choice-based Modelling by Destination Value and Type of Planning for Domestic Leisure Travellers in India. Journal of Urban Planning and Development, 140 (1), ASCE.

[9] Rastogi, R., Harikrishna, M. and Patil, A (2015), Segmentation Analysis of Domestic Tourists: A Case Study. KSCE Journal of Civil Engineering, Vol. 19 (5), 1509-1522.

[10] Rodriguez, A, Latkova,P., Sun, Y.Y.," The relationship between leisure and life satisfaction: application of activity and need theory", Social Indicators Research, Springer Science, (2008) Vol.86, 163-175.

[11] Ryuichi Kitamura, Cynthia Chen, And Ravi Narayanan, "Traveler Destination Choice BehaviorEffects of Time of Day, Activity Duration, and Home Location" Transportation Research Record,98-1272

[12] Simma A., Schlich, R. and Axhausen, K.W. "Destination choice modelling for different leisure activities", Arbeitsbericht Verkehrs- and Raumplanung, (2002), Vol.99, 235-258.

[13] Tzu-Kuang Hsu, Yi-Fan Tsai and Herg-Huey Wu "The preference analysis for tourist choice of destination: A case study of Taiwan", Tourism Management, Elseiver Science Ltd., (2009), Vol.30, 288-297.

[14] Woodside A.G. and Lysonski S. "A general model of traveller destination choice", Journal of Travel Research, Sage Publications, (1989) Vol.27, 8-14.